



NBS SPECIAL PUBLICATION 393

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards

Colorimetry and Spectrophotometry: A Bibliography of NBS Publications January 1906 Through January 1973

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards¹ was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau consists of the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Institute for Computer Sciences and Technology, and the Office for Information Programs.

THE INSTITUTE FOR BASIC STANDARDS provides the central basis within the United States of a complete and consistent system of physical measurement; coordinates that system with measurement systems of other nations; and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of a Center for Radiation Research, an Office of Measurement Services and the following divisions:

Applied Mathematics — Electricity — Mechanics — Heat — Optical Physics — Nuclear Sciences² — Applied Radiation² — Quantum Electronics³ — Electromagnetics³ — Time and Frequency³ — Laboratory Astrophysics³ — Cryogenics³.

THE INSTITUTE FOR MATERIALS RESEARCH conducts materials research leading to improved methods of measurement, standards, and data on the properties of well-characterized materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; and develops, produces, and distributes standard reference materials. The Institute consists of the Office of Standard Reference Materials and the following divisions:

Analytical Chemistry — Polymers — Metallurgy — Inorganic Materials — Reactor Radiation — Physical Chemistry.

THE INSTITUTE FOR APPLIED TECHNOLOGY provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government; cooperates with public and private organizations leading to the development of technological standards (including mandatory safety standards), codes and methods of test; and provides technical advice and services to Government agencies upon request. The Institute consists of a Center for Building Technology and the following divisions and offices:

Engineering and Product Standards — Weights and Measures — Invention and Innovation — Product Evaluation Technology — Electronic Technology — Technical Analysis — Measurement Engineering — Structures, Materials, and Life Safety⁴ — Building Environment⁴ — Technical Evaluation and Application⁴ — Fire Technology.

THE INSTITUTE FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides technical services designed to aid Government agencies in improving cost effectiveness in the conduct of their programs through the selection, acquisition, and effective utilization of automatic data processing equipment; and serves as the principal focus within the executive branch for the development of Federal standards for automatic data processing equipment, techniques, and computer languages. The Institute consists of the following divisions:

Computer Services — Systems and Software — Computer Systems Engineering — Information Technology.

THE OFFICE FOR INFORMATION PROGRAMS promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal Government; promotes the development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System; provides appropriate services to ensure that the NBS staff has optimum accessibility to the scientific information of the world. The Office consists of the following organizational units:

Office of Standard Reference Data — Office of Information Activities — Office of Technical Publications — Library — Office of International Relations.

¹ Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

² Part of the Center for Radiation Research.

³ Located at Boulder, Colorado 80302.

⁴ Part of the Center for Building Technology.

Colorimetry and Spectrophotometry: A Bibliography of NBS Publications January 1906 Through January 1973

Kenneth L. Kelly

Building Environment Division
Center for Building Technology
Institute for Applied Technology
National Bureau of Standards
Washington, D.C. 20234



U.S. DEPARTMENT OF COMMERCE, Frederick B. Dent, *Secretary*
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, *Director*

Issued April 1974

Library of Congress Cataloging in Publication Data

Kelly, Kenneth Low, 1910-

Colorimetry and spectrophotometry: a bibliography
of NBS publications, January 1906 through January 1973.

(NBS special publication 393)

Supt. of Docs. no.: C 13.10: 393.

1. Colorimetry--Bibliography. 2. Spectrophotom-
etry--Bibliography. I. United States. National Bureau
of Standards. II. Title. III. Series: United
States. National Bureau of Standards. Special publi-
cation 393.

QC100.U57 no. 393 [Z7144.C7] 389'.08s [016.543'085]
74-5090

National Bureau of Standards Special Publication 393

Nat. Bur. Stand. (U.S.), Spec. Publ. 393, 54 pages (Apr. 1974)

CODEN: XNBSAV

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 1974

COLORIMETRY AND SPECTROPHOTOMETRY:
A BIBLIOGRAPHY OF NBS PUBLICATIONS
JANUARY 1906 THROUGH JANUARY 1973

Kenneth L. Kelly

This bibliography of publications will serve as the key to the large amount of research into color measurement and specification, and color vision carried out by the staff of the National Bureau of Standards (NBS) in colorimetry and spectrophotometry. These 623 publications appeared in NBS publications and outside scientific and technical journals between January 1906 and January 1973. This material has been in constant demand by Bureau members as well as by outside individuals and organizations. The practical value of this wealth of information lies in its ready accessibility to the scientific and technical fraternity by title, by key words or by author, in the Library of Congress and in depository libraries such as large public and university libraries. A short organizational chronology of the colorimetry and spectrophotometry program is included.

Key Words: Bibliography; color; color codes; color measurement; colorimetry; spectrophotometry; vision.

1. INTRODUCTION

This paper lists the 623 publications on colorimetry¹ and spectrophotometry² authored by members of the staff of the National Bureau of Standards published during the years 1906 to 1973. (There were no relevant papers between 1901, the year the Bureau was founded, and 1906). This listing, made necessary by the constant demand for this information, also contains the publications of Research Associates and Guest Workers in these fields. In addition to the chronological list³, it contains an Author⁴ and a Subject Index⁵. The reference numbers appearing in these indexes refer to the entries in the chronological listing. A short organizational chronology of the colorimetry and spectrophotometry program is included.

2. HISTORY

Soon after the founding of the Bureau of Standards in 1901⁶, studies in photometry and colorimetry were undertaken by members of the staff at the request of business, science and industry. The results of these studies appeared as papers in the Bulletin of the Bureau of Standards and in other scientific and technical journals. Among the projects undertaken in these formative years were those in the fields of length, electricity, spectroscopy, fibers

¹Colorimetry - the study of color measurement, specification, designation, tolerances, blindness, color-order systems, vision.

²Spectrophotometry - the spectral measurement of reflecting or transmitting samples, including reduction of the data.

³See Sections 9.

⁴See Section 11.

⁵See Section 10.

⁶Name changed from Bureau of Standards (BS) to the National Bureau of Standards (NBS) in 1934.

and clinical thermometers in addition to the work in photometry and colorimetry. The challenges to these "pioneers" were tremendous as shown by the diversity of fields studied by so few men. Standardization of colors was the field of research which attracted the most interest and concern in industry as well as in the scientific community [1]⁷. Requests for assistance in color measurement and standardization were received from the fields of cottonseed oil, margarine, butter, from glass (in signal lamps, headlights and spectacles for eye protection), to petroleum oil, turpentine, rosin, paper and textiles, from flour, sugar, eggshells, egg yolks, dyes and water to chemical solutions, paints, portland cement, tobacco, to porcelain, enamels and even blood and human skin -- the latter of concern to biologists and anthropologists.

The list of authors of these papers reads like an early Who's Who in Science. Some of these men later rose through the ranks at the Bureau, while others went to scientific or industrial organizations where they carried on the high-level and imaginative research which characterized their early developmental years at the Bureau. Many of the early papers listed in this report formed the cornerstones of all photometry and colorimetry, such as the one on the standard visibility curve [2] by Gibson (1916)⁸ and Tyndall (1919)⁸, and the paper defining the International Commission on Illumination (ICI) (now Commission Internationale de l'Eclairage (CIE)) Standard Observer and Coordinate System [3] by Judd (1927)⁸.

It can be seen from the chronological listing that the early colorimetry work was carried on by Hyde (1902)⁸, Nutting (1903)⁸ and Ives (1908)⁸; Nutting was in charge in 1911. In 1913 Mr. Irwin G. Priest (1907)⁸ was Chief of the Section on Colorimetry in the Optics Division, and he continued in that capacity until his death in 1932, when he was followed as Chief by Dr. K. S. Gibson. In 1948 the Optics Division was merged with the Electricity Division to form the Division of Electricity and Optics, and by reorganization the Division of Optics and Metrology in 1950. In 1955, on Dr. Gibson's retirement, Mr. L. E. Barrow became Chief of the Photometry and Colorimetry Section which in 1960 became part of the Metrology Division. In 1966 the Colorimetry and Spectrophotometry Section was reformed with Mr. I. Nimeroff as Chief. When the Metrology Division was combined with the Division of Atomic and Molecular Physics in 1969, the colorimetry program was transferred into the Institute for Applied Technology and designated as the Office of Colorimetry. The Spectrophotometry part of the old Colorimetry and Spectrophotometry Section became the Spectrophotometry Section of the new Optical Physics Division. Most of the Office of Colorimetry was transferred in 1970 to the Applied Acoustics and Illumination Section of the Building Research Division⁹. Now the colorimetry program is in the Sensory Environment Section of the Building Environment Division. Dr. Judd, one of the world authorities on color, remained with the colorimetry program until his death in 1972, although assigned as consultant to the Director of the Institute for Applied Technology. Despite the organizational changes identified above, significant work continued on color standards, tolerances, measurement, specification and color vision.

These changes reflect new demands from rapidly expanding fields of research. Among these, for instance, are challenging new problems arising from the fast growing fields of aerospace (heat balance between solar radiation and cold in space craft), color standards and tolerances (specify color and acceptable variation in purchase specifications) and safety (one safety color code for marking physical hazards and highway traffic signs, adapted to help color blind).

3. CONTRIBUTIONS FROM PRIVATE INDUSTRY

A considerable source of inspiration and support to the Colorimetry Section in its early days came from Mr. A. H. Munsell, a noted artist from Boston. Mr. Munsell realized that there was no practical and scientific method of teaching color either in art schools or in the grade schools where most students get their first color instruction. He worked toward the realization of "a simple and practical notation, or method of writing (designating)

⁷Figures in brackets [] indicate the literature references in the Bibliography (Section 8).

⁸Year each joined the Bureau of Standards.

⁹Now the Center for Building Technology.

color" [4] by the use of a system that "portrays the three dimensions (hue, value or lightness and chroma or saturation) of color, and measures each by an appropriate scale" [5], each scale to consist of colored samples separated by visually equal steps. The clarifying phrases in parentheses are the author's.

Mr. Munsell's first contact with the Bureau of Standards was in 1901, just after the formation of the Bureau when he wrote Dr. Stratton, the Director, "asking about color" [6]. He visited the Bureau in 1911 where he met Dr. P. G. Nutting who was in charge of the work that included colorimetry. Mr. Munsell's son, Mr. A.E.O. Munsell, met Mr. Priest in 1921 and from this meeting a very close relationship developed from which the Colorimetry and Spectrophotometry Section has benefited materially throughout the years. An indication of the degree of cooperation, is the fact that the Munsell Color Company has placed seven Research Associates at the Bureau. By 1940, 23 papers covering this work had been presented to the Optical Society of America [7]. In addition, a good deal of unpublished work was performed which contributed "to the development of basic information necessary, if (the) Munsell (color-order system), or any other color system was to be critically studied or standardized" [8].

This work funded by the Munsell Research Laboratory was conducted both at NBS and at the Munsell Research Laboratory in Baltimore. In addition to the regular Munsell Color Company staff, seven persons were employed at one time or another in the strictly scientific work at the Baltimore Laboratory. These were: Miriam O'Brian, Louise Sloan (Rowland), Geraldine Walker (Haupt), employed by NBS in 1927, I. H. Godlove, Carl Boechner, Prentice Reeves and Willard Valentine. The seven Research Associates placed at NBS were: Casper L. Cottrell, I. G. Priest, D. B. Judd, F. H. Harris (retired later as Section Chief in the Electricity Division), F. G. Brickwedde (retired later as Division Chief of the Heat and Power Division), E.P.T. Tyndall and W. Greenberg.

A significant contribution of the Colorimetry and Spectrophotometry Section to the designation of color in art, science and industry came through research funded by the American Pharmaceutical Association. This work led to a simple, easily understood and accurately defined method of designating colors "in which the color-name boundaries were specified in Munsell notation" [9]. It also provided the impetus for many of the papers listed here, culminating with the Color Names Dictionary (NBS Circular 553) [10] published by the Inter-Society Color Council (ISCC) and the National Bureau of Standards (NBS) in 1955, the ISCC-NBS Centroid Color Charts (NBS Standard Sample #2106) [11] in 1965 and the Universal Color Language [12] in 1965. In addition, this research played a vital role in the formation of the Inter-Society Color Council (ISCC)¹⁰ in 1931 and the Color Marketing Group (CMG)¹¹ in 1962.

The close cooperation between NBS and the Munsell Color Company has continued through the years. This has resulted in such landmark developments as the Munsell Renotation System in 1943, in which the spacings in the three scales of hue, value (lightness) and chroma (saturation) were smoothed and each color was specified in the 1931 CIE system, and facilitated Munsell's significant contribution to the development of the ISCC-NBS Centroid Colors in 1965. The Munsell Color Company in 1967 funded a cooperative study to develop an improved, visually uniform, color spacing technique based on the work of the Optical Society of America (OSA) Committee on Uniform Color Scales (1966).

¹⁰The founding of the Inter-Society Color Council was a direct outgrowth of the early work on the color-names project. It exists as a medium for interchange of information and development of basic concepts on color-related problems.

¹¹The Color Marketing Group was a direct outgrowth of the ISCC. Its purpose is the use of color to better market products and services at a profit.

In 1942, the Munsell Color Foundation was formed at the request of the members of the Munsell family. Two of the duties of this non-profit Foundation were to hold the stock of and assume the direction of the Munsell Color Company. A further indication of the continuing close cooperation between NBS and the Munsell Color Company was a stipulation in the formation of the Foundation, that one of the three original Trustees was to be appointed by the Director of NBS. Dr. Judd was so appointed, and was elected President of the Foundation by the other Trustees. He served as President without remuneration from its formation in 1942 until his death in 1972.

Many scientific and technical associations and companies have contributed to the work of the Colorimetry and Spectrophotometry Section, and in so doing, have benefited in return. The Corning Glass Works, for instance, through their Dr. H. P. Gage cooperated with our Dr. K. S. Gibson between 1926 and 1946 in the development and application of colored glass filters to be used as the color standards in railway signaling in this country. Before the development of spectrophotometry and the 1931 CIE Standard Observer and coordinate System [3] as the means of interpreting spectrophotometric data, standard limit glasses were used to control the range of color acceptable for a particular signal application. So successful was this system that it served as the basis of the signaling systems used later for the control of vehicular, marine and aircraft traffic. Only now is this system of colored glass standards being slowly supplanted by photoelectric colorimetry and spectroradiometry, a method by which the color of the whole signal device consisting of a lamp or kerosene flame, reflector and colored lens, can be measured in operating position.

4. IMPACT OF PUBLICATIONS

The papers listed here have had a considerable influence on the development and application of color in science, art and industry. The chronological listing, including the Author and Subject Indexes is almost synonymous with the basic work in vision in the first three quarters of the 20th century. Researchers like Nutting, Tyndall, Priest, Gibson, Judd and Hunter (1927)⁸ are among those who contributed greatly to the fields of vision as well as color. Judd's basic book on Color in Business, Science and Industry in its two editions, has been "the" textbook in color psychophysics¹² since its publication in 1952. Subjects like the visibility of radiant energy (now the luminous efficiency function), photometry of lamps, color vision, color blindness, color-order systems, the CIE Standard Observer and Coordinate System, spectrophotometry, color measurement and specification, safety color codes, gloss and other surface characteristics, color temperature, color standards and tolerances constitute only a partial listing of the contributions made by NBS to the development and application of color in commerce and industry.

5. COOPERATION WITH OUTSIDE ORGANIZATIONS

Throughout the years, the members of the Colorimetry and Spectrophotometry Section have contributed to and held positions of leadership in many scientific and technical organizations. In several they have been charter members. Among these are:

- American Association for the Advancement of Science
- American Ceramic Society
- American Institute of Physics
- American Instrument Society
- American Medical Association
- American Oil Chemists Society
- American Pharmaceutical Association
- American Physical Society
- Astronomical Society
- Association of Physics Teachers
- Color Marketing Group
- Illuminating Engineering Research Institute

¹²Color Psychophysics is the study and application of psychophysical methods to the investigation and measurement of color.

Institute of Electrical Engineers
International Color Association
International Commission on Illumination
Inter-Society Color Council
London Illuminating Engineering Society
Munsell Color Foundation
Optical Society of America
Physical Society of London
Societe Francaise de Physique
Union of Geodesy and Geophysics
Washington Academy of Medicine
Washington Academy of Sciences

The members have also contributed to and held positions in a number of standardizing organizations, such as:

American Association of Textile Chemists and Colorists
American National Standards Institute (first the American Engineering Standards Committee, then the American Standards Association, then the United States of America Standards Institute)
American Society for Testing and Materials
Association of American Railroads
Electronic Industries Association
Illuminating Engineering Society
Institute of Traffic Engineers
International Standards Organization
National Education Association
National Joint Committee on Uniform Traffic Control Devices for Streets and Highways
Technical Association of the Pulp and Paper Industry
Textile Color Card Association (now the Color Association of the United States)

They have also worked closely with and contributed to programs dealing with color in a number of government agencies including:

Department of Agriculture
Department of Defense
Department of Transportation
Federal Aviation Administration
Federal Communications Commission
General Services Administration
National Academy of Sciences
National Research Council
Occupational Safety and Health Administration
Post Office Department
Veterans Administration

Another important contribution of the Colorimetry and Spectrophotometry Section throughout its more than a half-century of existence, has been the sharing of its expertise with those non-professionals as well as specialists seeking information on color and vision. Letters of inquiry and requests for assistance have come from all parts of the United States and cover a wide range of subjects. An indication of the diversity of the requests is provided by the following examples:

Tell me all about color
What colors were the circle and dot of the insignia on the allied planes in World War I?
What color is 31643?
Detailed requests about color vision
Requests for assistance in developing color standards and tolerances for the Federal Government or for industry
Requests for color assistance in books on photogrammetry, flowers, oceanography, mushrooms

6. THE NUMBERING SYSTEM

The individual papers in this list have been arranged according to the year and month of publication. As stated earlier, each paper has been assigned a serial number starting with 1. These numbers are also used to reference individual papers under specific headings and under authors' names in the Author Index and in the Subject Index.

Each reference includes besides the chronological serial number, the author's name(s), the title of the paper or abstract, the abbreviation of the journal or publication in which it appears, the volume number underscored, the beginning page number and the year of publication in parentheses. If the paper is published in more than one journal, subsequent references follow the first and are separated by semicolons.

7. IN APPRECIATION

It is a pleasure to acknowledge the contributions of each of the members of the Colorimetry and Spectrophotometry Section, especially Dr. Deane B. Judd who sponsored this project, and who, with his very broad knowledge and experience, was a constant source of inspiration and guidance.

8. BIBLIOGRAPHY

1. Cochrane, Rexmond C., Measures for Progress, A History of the National Bureau of Standards, page 270. Superintendent of Documents, U.S. Gov't. Printing Office, Washington, D.C. 20402.
2. Gibson, K. S. and Tyndall, E.P.T. See item 90 in Section 9.
3. Judd, Deane B., See item 221 in Section 9.
4. Nickerson, Dorothy, History of the Munsell Color System, Color Engineering 7, 42 (Sept.-Oct. 1969).
5. Ibid, p. 42.
6. Nickerson, Dorothy, History of the Munsell Color System and Its Scientific Application, J. Opt. Soc. Amer. 30, 576 (1940).
7. See 4 above, p. 46.
8. Ibid, p. 47.
9. Ibid, p. 49; also see 6 above, p. 585.
10. Kelly, K. L. and Judd, D. B., See item 465a in Section 9.
11. See item 517a in Section 9.
12. Kelly, Kenneth L., see item 518 in Section 9.

9. CHRONOLOGICAL LIST OF PUBLICATIONS

1. Hyde, Edward P.
Talbot's law as applied to the rotating
sectored disk.
Bull. Bur. Stand. 2, 1 (1906) S26.
2. Nutting, P. G.
A pocket spectrophotometer.
Bull. Bur. Stand. 2, 317 (1906) S39.
3. Nutting, P. G.
Purity and intensity of monochromatic
light source.
Sci. Pap. Bur. Stand. 2, 439 (1907) S44.
4. Nutting, P. G.
The complete form of Fechner's law.
Bull. Bur. Stand. 3, 59 (1907) S49.
5. Nutting, P. G.
The luminous equivalent of radiation.
Sci. Pap. Bur. Stand. 5, 261 (1908)
S103.
6. Nutting, P. G.
A method for constructing the natural
scale of pure color.
Bull. Bur. Stand. 6, 89 (1909-10) S118.
7. Nutting, P. G.
Luminosity and temperature.
Bull. Bur. Stand. 6, 337 (1909-10)
S103.
8. Ives, Herbert E.
Daylight efficiency of artificial
illuminants.
Bull. Bur. Stand. 6, 231 (1909-10)
S125.
9. Ives, Herbert E.
White light from the mercury arc and
its complementary.
Bull. Bur. Stand. 6, 265 (1909-10)
S128.
10. Nutting, P. G.
The visibility of radiation. A
recalculation of Koenig's data.
Bull. Bur. Stand. 7, 235 (1911) S154.
11. Nutting, P. G.
A photometric attachment for spectro-
scopes.
Bull. Bur. Stand. 7, 239 (1911) S155.
12. Nutting, P. G.
A new precision colorimeter.
Bull. Bur. Stand. 9, 1 (1913) S187.
13. Priest, Irwin G.
Color specifications.
Rep. Proc. Fourth Ann. Meet. Soc.
Cotton Products Analysts (now the Amer.
Oil Chem. Soc.), p. 6, June 21, 1913.
14. Priest, Irwin G.
A photometric error sometimes accompanying
the use of a pair of nicols, and a
proposal for its elimination.
J. Wash. Acad. Sci. 3, 298 (1913).
15. Coblentz, W. W.
The diffuse reflecting power of various
substances.
Bull. Bur. Stand. 9, 283 (1913) S196.
16. Priest, Irwin G.
The quartz colorimeter and its
applicability to the color grading of
cotton seed oil.
Rep. Proc. Fifth Ann. Meet. Soc.
Cotton Products Analysts (now Amer. Oil
Chem. Soc.) p. 21, May 16, 1914.
17. Priest, Irwin G.
A proposed method for the photometry of
lights of different colors.
Phys. Rev. (2), 6, 64 (1915); 9, 341
(1917); 10, 208 (1917).
18. Priest, Irwin G.
The Bureau of Standards contrast method
for measuring transparency.
Trans. Amer. Ceram. Soc. 17, 150 (1915).
19. Priest, Irwin G. and Peters, Chauncey G.
Report on investigations concerning the
color and spectral transmission of
cotton seed oil.
Report Proc. Sixth Ann. Conv. Soc.
Cotton Products Analysts (now Amer.
Oil Chem. Soc.), p. 67, May 14-15, 1915.
20. Priest, Irwin G.
A simple spectral colorimeter of the
monochromatic type.
J. Wash. Acad. Sci. 6, 74 (1916).
21. Gibson, K. S.
The effect of temperature upon the
coefficient of absorption of certain
glasses of known composition.
Phys. Rev. N. S., 7, 194 (1916).
22. Middlekauf, G. W. and Skogland, J. F.
An interlaboratory photometric comparison
of glass screens and of tungsten lamps,
involving color differences.
Sci. Pap. Bur. Stand. 13, 287 (1916)
S277.
23. Gibson, K. S.
The effect of temperature upon the
absorption spectrum of a synthetic ruby.
Phys. Rev. N. S. 8, 38 (1916).

- 23a. Priest, I. G.
Specifications of the transparency of paper and tracing cloth.
BS Circ. No. 63 (May 1917).
24. Priest, Irwin G. and Peters, Chauncey G.
Measurement and specification of the physical factors which determine the saturation of certain tints of yellow.
Tech. Pap. Bur. Stand. No. 92 (1917) T92.
25. Howe, H. E. and Gibson, K. S.
The ultraviolet and visible absorption spectra of phenolphthalein, phenol-sulphonphthalein and some halogen derivatives.
Phys. Rev. N.S. 10, 767 (1917).
26. Crittenden, E. C. and Richtmyer, F. K.
An "average eye" for heterochromatic photometry, a comparison of a flicker and an equality-of-brightness photometer.
Bull. Bur. Stand. 14, 87 (1918-19) S299.
27. Coblentz, W. W. and Emerson, W. B.
Relative sensibility of the average eye to light of different colors and some practical applications to radiation problems.
Bull. Bur. Stand. 14, 167 (1918-19) S303.
28. Coblentz, W. W. and Emerson, W. B.
Luminous radiation from black body and the mechanical equivalent of light.
Sci. Pap. Bur. Stand. 14, 255 (1917) S305.
29. Priest, Irwin G.
The work of the National Bureau of Standards on the establishment of color standards and methods of color specification.
Trans. Illum. Eng. Soc. 13, 38 (1918).
30. Priest, Irwin G.
Discussion of Troland's paper "Psychology of Color".
Trans. Illum. Eng. Soc. 13, 21 (1918).
With special reference to determination of standard of white light. Trans. Illum. Eng. Soc. 13, 74 (1918).
32. Priest, Irwin G.
A precision method for producing artificial daylight.
Phys. Rev. (2), 11, 502 (1918).
33. Priest, Irwin G.
The law of symmetry of the visibility function.
Phys. Rev. (2), 11, 498 (1918).
34. Coblentz, W. W., Emerson, W. B. and Long, M. B.
Spectroradiometric investigation of the transmission of various substances.
Bull. Bur. Stand. 14, 653 (1918-19) S325.
35. Gibson, K. S.
Photoelectric spectrophotometry by the null method.
Sci. Pap. Bur. Stand. 15, 325 (1919-1920) S349.
36. Priest, Irwin G.
A one-term pure exponential formula for the spectral distribution of radiant energy from a complete radiator.
J. Opt. Soc. Amer. 2-3, 18 (1919).
37. Coblentz, W. W. and Emerson, W. B.
Glasses for protecting the eyes from injurious radiations (3rd edition).
Tech. Pap. Bur. Stand. No. 93 (1919) T93.
38. Priest, Irwin G.
A new formula for the spectral distribution of energy from a complete radiator.
Phys. Rev. (2), 13, 314 (1919); 14, 191 (1919).
39. Gibson, K. S. and McNicholas, H. J.
The ultraviolet and visible transmission of eye-protective glasses.
Tech. Pap. Bur. Stand. No. 119 (1919) T119.
40. Priest, Irwin G. and Gibson, K. S.
Report on the applicability of ultraviolet rays to signaling.
Phys. Rev. (2), 14, 188 (1919).
41. Priest, Irwin G. and Tyndall, E.P.T.
Optical and photographic methods for the detection of invisible writing.
Phys. Rev. (2), 14, 188 (1919).
42. Priest, Irwin G.
A method for the color grading of red flares.
Phys. Rev. (2), 14, 264 (1919).
43. Priest, Irwin G., Meggers, W. F., McNicholas, H. J., Gibson, K. S. and Tyndall, E.P.T.
The spectral composition and color of certain high intensity searchlight arcs. (In cooperation with the Searchlight Investigation Section, Corps of Engineers, USA).
Phys. Rev. (2), 14, 184 (1919).
44. Gibson, K. S., Tyndall, E.P.T. and McNicholas, H. J., The spectral transmission of filters used to detect camouflage or improve visibility.
Phys. Rev. (2), 14, 261 (1919).

45. Priest, Irwin G.
The color of soya bean oil as compared with that of cottonseed oil.
Cotton Oil Press 3, No. 9, 37, (1919-20).
46. Priest, Irwin G.
Recommendations in regard to color grading of cottonseed Oil.
Cotton Oil Press 3, No. 3, 86 (1919-20).
47. Gibson, K. S., Tyndall, E.P.T. and McNicholas, H. J.
The ultra-violet and visible transmission of various colored glasses.
Tech. Pap. Bur. Stand. No. 148 (1920) T148.
48. Karrer, Enoch and Tyndall, E.P.T.
Contrast sensibility of the eye.
Sci. Pap. Bur. Stand. 15, 679 (1919-20) S366.
49. Priest, Irwin G.
Abstract of report on investigation of the color and spectral transmissivity of vegetable oils.
Cotton Oil Press 4, No. 3, 95 (1920-21). (Abstract).
50. Karrer, Enoch and Tyndall, E.P.T.
Relative spectral transmission of the atmosphere.
Sci. Pap. Bur. Stand. 16, 377 (1920) S389.
51. Priest, Irwin G., Meggers, W. F., Gibson, K. S., Tyndall, E.P.T. and McNicholas, H. J.
Color and spectral composition of certain high-intensity searchlight arcs.
Tech. Pap. Bur. Stand. No. 168 (1920) T168.
52. Priest, Irwin G., Gibson, K. S. and McNicholas, H. J.
An examination of the Munsell color system. I. Spectral and total reflection and the Munsell scale of value.
Tech. Pap. Bur. Stand. No. 167 (1920) T167.
53. Priest, Irwin G.
Note on the relation between the frequencies of complementary hues.
J. Opt. Soc. Amer. 4, 402 (1920); and 5, 513 (1921).
54. Priest, Irwin G.
Preliminary note on the relations between the quality of color and the spectral distribution of light in the stimulus.
J. Opt. Soc. Amer. 4, 389 (1920).
55. Priest, Irwin G. and Frehafer, M. K.
The optical basis of Bittinger's camouflage paintings.
J. Wash. Acad. Sci. 11, 238 (1921) (Abstract); J. Opt. Soc. Amer. 4, 390-395 (1920).
56. Gibson, K. S.
Infra-red absorption spectra of vegetable oils.
Cotton Oil Press 4, No. 5, 53 (1920-21).
57. Priest, Irwin G.
A new study of the leucoscope and its application to pyrometry.
J. Opt. Soc. Amer. 4, 448 (1920).
58. Priest, Irwin G.
The application of rotatory dispersion to colorimetry, photometry and pyrometry.
Phys. Rev. (2), 15, 538 (1920).
59. Priest, Irwin G.
Report on calibration of sixteen Lovibond red glasses of nominal value 7.6.
Cotton Oil Press 4, No. 9, 43 (1920-21).
60. Priest, Irwin G.
Statement to the color committee, American Oil Chemists' Society meeting at the National Bureau of Standards, Washington, July 30, 1920.
Cotton Oil Press 4, No. 6, 45 (1920-21).
61. Priest, Irwin G.
The spectral distribution of energy required to evoke the gray sensation.
J. Opt. Soc. Amer. 5, 205 (1921). (Abstract); Photogr. J. (Harrison & Sons, Ltd., London, Eng.), 61 (new series 45), 360 (1921); Sci. Pap. Bur. Stand. 17, 231 (1922) S417.
62. Priest, Irwin G.
A direct reading spectrophotometer for measuring the transmissivity of liquids.
Phys. Rev. (2), 18, 127 (1921) (Abstract).
63. Priest, Irwin G.
A method of obtaining radiant energy having the visible spectral distribution of a complete radiator at very high temperatures.
J. Opt. Soc. Amer. 5, 178 (1921).
64. Priest, Irwin G.
The complete scale of color temperature and its application to the color grading of daylight and artificial illuminants.
Phys. Rev. (2), 20, 93 (1922). (Abstract).

65. Coblenz, W. W.
Spectroradiometric investigation of the transmission of various substances, II. Sci. Pap. Bur. Stand. 17, 267 (1922) S418.
66. Lofton, R. E.
A measure of the color characteristics of white papers. Tech. Pap. Bur. Stand. 17, 667 (1922-24) T244.
68. Gibson, K. S., McNicholas, H. J., Tyndall, E.P.T. and Frehafer, M. K.
The spectral transmissive properties of dyes. I. Seven permitted food dyes, in the visible, ultra-violet, and near infrared. (With the cooperation of W. E. Mathewson, Bureau of Chemistry). Sci. Pap. Bur. Stand. 18, 121 (1922-23) S440.
69. Troland, L. T.
Chairman, Optical Society of America Committee on Colorimetry, Report for 1920-21. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 6, 527 (1922).
70. Priest, Irwin G.
Measurement of the color temperature of the more efficient artificial light sources by the method of rotatory dispersion. Sci. Pap. Bur. Stand. 18, 221 (1922-23) S443; J. Opt. Soc. Amer. and Rev. Sci. Instrum. 6, 410 (1922).
71. Priest, Irwin G.
Progress on the determination of normal gray light. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 72 (1923). (Abstract).
72. Priest, Irwin G. and Cottrell, Casper L.
The effect of various conditions upon the determination of the normal stimuli of gray. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 73 (1923). (Abstract).
73. Frehafer, M. Katherine.
New tables and graphs for facilitating the computations of spectral energy distribution by Planck's formula. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 74 (1923). (Abstract).
74. Priest, Irwin G.
Preliminary data on the color of daylight at Washington. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 78 (1923). (Abstract).
75. Priest, Irwin G.
Apparatus for the determination of hue sensibility (wave-length differences perceptible by difference in hue) and the visibility of radiant energy. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 99 (1923). (Abstract).
76. Danielson, R. R. and Frehafer, M. K.
The effect of some substitutes for tin oxide on the opacity of white enamels for sheet steel. J. Amer. Ceram. Soc. 6, 634 (1923).
77. Schertz, F. M., The quantitative determination of carotin by means of the spectrophotometer and the colorimeter. J. Agr. Res., U. S. Dept. Agr. 26, 383 (1923).
78. Gibson, K. S.
Direct-reading photoelectric measurement of spectral transmission. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 693 (1923).
79. Priest, Irwin G.
The colorimetry and photometry of day light and incandescent illuminants by the method of rotatory dispersion. Trans. Illum. Eng. Soc. 18, 861 (1923); J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 1175 (1923).
80. Priest, Irwin G.
Review of Peddie's "Colour Vision". J. Opt. Soc. Amer. and Rev. Sci. Instrum. 7, 1251 (1923).
81. Gibson, K. S.
Spectrophotometry. Dict. of Applied Physics, edited by Sir Richard Glazebrook (MacMillan and Co., Ltd., London) 4, 737 (1923).
82. Priest, Irwin G., Gibson, K. S. and Munsell, A.E.O.
A comparison of experimental values of dominant wave-length and purity with their values computed from the spectral distribution of the stimulus. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 8, 28 (1924). (Abstract).
83. Priest, Irwin G.
Apparatus for the determination of color in terms of dominant wave length, purity and brightness. J. Opt. Soc. Amer. and Rev. Sci. Instrum. 8, 173 (1924).

84. Priest, Irwin G., McNicholas, H. J. and Frehafer, M. Katherine.
Some tests of the precision and reliability of measurements of spectral transmission by the König-Martens spectrophotometers.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 8, 201 (1924).
85. Appel, W. D.
The elimination of variables in the dyeing method of testing dyes.
Amer. Dyest. Rep. 13, 507 (1924).
86. Appel, W. D. and Brode, W. R.
Spectrophotometric analysis applied to chromotrope 10B.
Ind. Eng. Chem. 16, 797 (1924).
87. Gibson, K. S.
Spectral characteristics of test solutions used in heterochromatic photometry.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 9, 113 (1924).
88. Tyndall, E.P.T. and Gibson, K. S.
Visibility of radiant energy equation.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 9, 403 (1924).
89. Priest, Irwin G.
The computation of colorimetric purity. (With the collaboration of L. B. Tuckerman, Herbert E. Ives and F. K. Harris).
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 9, 503 (1924).
90. Gibson, K. S. and Tyndall, E.P.T.
Visibility of radiant energy.
Sci. Pap. Bur. Stand. 19, 131 (1923-24) S475; Trans. Illum. Eng. Soc. 19, 176 (1924).
91. Gibson, K. S.
Some tests on the accuracy of measurement with the rotatory dispersion colorimetric photometer.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 11, 75 (1925).
92. Priest, Irwin G.
Gray skies and white snow.
J. Wash. Acad. Sci. 15, 306 (1925);
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 11, 133 (1925). (Abstract).
93. Gibson, K. S.
Chairman, Optical Society of America Progress Committee for 1922-23, Report on spectrophotometry.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 10, 169 (1925).
94. Priest, Irwin G., Gibson, K. S. and Munsell, A.E.O.
The specification of color in terms of dominant wave-length, purity and brightness.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 10, 291 (1925). (Abstract).
95. Frehafer, M. Katherine and Snow, Chester, L.
Tables and graphs for facilitating the computation of spectral energy distribution by Planck's formula.
Misc. Pub. Bur. Stand. No 56 (1925) M56.
96. Schertz, F. M.
The quantitative determination of xanthophyll by means of the spectrophotometer and the colorimeter.
J. Agr. Res., U. S. Dept. Agr. 30, 253, (1925).
97. Lloyd, Morton C.
Traffic signals.
Proc. Int. Ass'n. Municipal Electricians, 30th Meeting, Detroit (Int. Ass'n Munic. Elec., West New York, New Jersey), p. 154 (1925).
98. Optical Society of America Progress Committee on Radiometry and Photometry, Report presented October 24, 1924.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 11, 357 (1925).
99. Gibson, K. S.
Spectral centroid relations for artificial daylight filters.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 11, 473, (1925).
100. Priest, Irwin G., Gibson, K. S. and Harris, F. K.
Measurements of illumination and color temperature at Washington during the solar eclipse, January 24, 1925.
Phys. Rev. (2) 25, 901 (1925). (Abstract).
101. Priest, Irwin G., Gibson, K. S. and Harris, F. K.
Determination of the time of a solar eclipse from measurements of relative illumination.
Phys. Rev. (2) 25, 902, (1925). (Abstract).
102. Burgess, George K.
United States Bureau of Standards eclipse observations.
Sci. Amer. 133, 170 (1925).
103. Brode, Wallace R.
The effects of solvents on the absorption spectrum of a simple azo dye.
J. Phys. Chem. 30, 56 (1926).

104. Bruce, H. D.
A photometric method for measuring the
hiding power of paints.
Tech. Pap. Bur. Stand. 20, 173
(1925-26) T306.
105. Appel, W. D., Brode, W. R. and
Welch, I. M.
Standardization of agalma black 10B.
Ind. Eng. Chem. 18, 627 (1926).
106. Brode, Wallace R.
The dissociation of potassium iodide
and the absorption spectra of iodine
and potassium iodide.
J. Amer. Chem. Soc. 48, 1877 (1926).
107. Brode, Wallace R.
The absorption spectra of benzene-
azobenzene.
J. Amer. Chem. Soc. 48, 1984 (1926).
108. Gibson, K. S.
Spectral filters.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 267 (1926); Intern.
Critical Tables (National Research
Council, Washington, D.C.) 5, 271
(1929).
109. Howe, H. E.
The color temperature of gas-filled
lamps as a function of time in service.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 304 (1926). (Abstract).
110. Gibson, K. S.
The production of radiant energy of
uniform intensity over the visible
spectrum.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 305 (1926). (Abstract).
111. Priest, Irwin G. and Brickwedde, F. G.
The minimum perceptible colorimetric
purity as a function of dominant wave-
length with sunlight as neutral
standard.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 306 (1926). (Abstract).
These data have been presented in more
detail in J. Opt. Soc. Amer. 22, 96
(1932), and 20, 262 (1930).
112. Priest, Irwin G.
An experiment bearing on the adoption
of a standard neutral stimulus in
colorimetry: the choice as between
"sun" and "equal energy".
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 306 (1926). (Abstract).
113. Priest, Irwin G.
Blue sky and white snow.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 308 (1926). (Abstract).
114. Priest, Irwin G.
Standard artificial sunlight for
colorimetric purposes.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 12, 479 (1926). (Abstract).
115. Gibson, K. S. and Harris, F. K.
A spectrophotometric analysis of the
Lovibond color system.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 12, 481 (1926). (Abstract).
116. Jones, L. A.
Chairman, Optical Society of America
Committee on unit of photographic
intensity, Report.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 12, 567 (1926).
117. Priest, Irwin G.
The computation of colorimetric purity.
II. Application of the purity formula
to non-spectral colors.
J. Opt. Soc. Amer. and Rev. Sci. Instrum.
13, 123 (1926).
118. Judd, Deane B.
The computation of colorimetric purity.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 133 (1926).
119. Bittinger, C.
Chairman, Optical Society of America
Committee on color terminology
questionnaire, Report.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 13, 43 (1926).
120. Gibson, K. S.
The relative visibility function.
Proc. of the Int. Comm. on Ill.,
6th Meeting, Geneva, 1924 (University
Press, Cambridge, Eng.) pp. 67 and
232 (1926).
121. Peters, H. H. and Phelps, F. P.
Color in the sugar industry. I. Color
nomenclature in the sugar industry.
II. Colorimetric classification of
turbid sugar solutions.
Tech. Pap. Bur. Stand. 21, 261 (1926-7)
T338.
122. Gibson, K. S., Harris, F. K. and
Priest, Irwin G.
The Lovibond color system. I. A
spectrophotometric analysis of the
Lovibond glasses.
Sci. Pap. Bur. Stand. 22, 1 (1927-8) S547.

123. Davis, Raymond and Gibson, K. S.
Reproducible liquid filters for the
production of "white light".
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 135 (1927). (Abstract).
124. Gibson, K. S.
A proposed method for the measurement
of the relative visibility function.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 135 (1927). (Abstract).
125. Priest, Irwin G. and Gibson, K. S.
Apparatus for the determination of
the visibility of energy and the
fundamental scales of visual
psychophysics.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 136 (1927). (Abstract).
126. Tyndall, E.P.T.
Sensibility to wavelength difference as
a function of purity.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 137 (1927). (Abstract).
127. Priest, Irwin G. and Judd, Deane B.
Sensibility to wavelength difference
and the precision of measurement of
dominant wavelength for yellow colors
of high saturation.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 137 (1927). (Abstract).
128. Priest, Irwin G.
An experiment on color discrimination
under commonplace conditions.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 138 (1927). (Abstract).
129. McNicholas, H. J.
On the use of the integrating sphere
in reflectometry.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 142 (1927). (Abstract).
130. Winters, S. R.
Colors in relation to business.
Trade Winds (The Union Trust Co.,
Cleveland, Ohio) 6, 16 (1927).
132. Judd, Deane B.
Purity and saturation; a saturation
scale for yellow.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 470 (1927). (Abstract).
133. Judd, Deane B.
The empiric relation between dominant
wavelength and purity.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 14, 475 (1927). (Abstract).
134. Davis, Raymond and Gibson, K. S.
Reproducible liquid filters for the
determination of the color temperatures
of incandescent lamps.
Phys. Rev. (2) 29, 916 (1927). (Abstract).
135. Priest, Irwin G.
Misuse of the name "Leucoscope".
Science 66, 78 (1927).
136. Lofton, R. E.
Study of the windows of window en-
velopes for the purpose of developing
standard specifications.
Tech. Pap. Bur. Stand. 21, 385 (1927)
T343.
137. Priest, Irwin G.
Correction of a prevalent error in
regard to the data on photometric
sensibility as a function of wave
length at low brightness.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 15, 82 (1927).
138. Priest, Irwin G.
Note on the relative comfort in
reading by artificial daylight and
unmodified gas-filled tungsten lamps.
J. Opt. Soc. Amer. and Rev. Sci.
Instrum. 15, 131 (1927).
139. Gibson, K. S.
Fluorescence as a means of detecting
the admixture of refined in unrefined
edible olive oil.
Tech. News Bull. Nat. Bur. Stand. No. 127,
Nov. 1927.
140. American Standards Association, American
Standard colors for traffic signals
(American Standards Association,
29 West 39th Street, New York, N. Y.)
1927.
141. Standardization of Lovibond glasses
(monthly reports from Colorimetry
Section to President of American Oil
Chemists' Society).
Oil Fat Ind. 4, 433 (1927); 5, 27,
58, 92, 114, 152, 184 (there are
many typographical errors in this
report), 220, 247, 278 (1928).
142. Priest, Irwin G.
Tests of color sense of AOCS members
and data on sensibility to change in
Lovibond red.
Oil Fat Ind. 5, 63 (1928).
143. Judd, Deane B. and Walker, Geraldine K.
A study of 129 Lovibond red glasses
with respect to the reliability of their
nominal grades.

Oil Fat Ind. 5, 16 (1928).

144. Judd, Deane B.
Saturation of colors determined from the visual response functions.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 115 (1928). (Abstract).
145. Appel, W. D.
A method for measuring the color of textiles.
Amer. Dyest. Rep. 17, 29 (1928).
146. Judd, Deane B.
Sensibility to color change determined from the visual response functions; extension to complete and partial dichromasy.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 115 (1928). (Abstract).
147. Priest, Irwin G. and Gibson, K. S.
Standardizing the red and yellow Lovibond glasses.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 116 (1928). (Abstract).
148. Macbeth, Norman, Color temperature classification of natural and artificial illuminants.
Trans. Illum. Eng. Soc. 23, 302 (1928). (Priest's blue-wedge colorimetric photometer is illustrated in this publication).
149. Priest, Irwin G.
Preliminary data on the least perceptible difference in dominant wavelength by the method of right and wrong answers.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 117 (1928). (Abstract).
150. Davis, Raymond and Gibson, K. S.
Filters for the reproduction of sunlight and the determination of color temperature.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 332 (1928). (Abstract).
151. McNicholas, H. J.
Equipment for routine spectral transmission and reflection measurements.
J. Res. Nat. Bur. Stand. 1, 793, (1928) RP30; J. Opt. Soc. Amer. and Rev. Sci. Instrum. 16, 333 (1928).
152. Davis, Raymond and Gibson, K. S.
Artificial sunlight for photographic sensitometry.
Proc. 7th Int. Cong. of Photography, London, 1928 (W. Heffer and Sons, Ltd., Cambridge, Eng.) p. 161 (1929); J. Soc. Motion Pict. Eng. 12, 225 (1928); Sci. Ind. Photogr. 8, 158 (1928).
153. Coblentz, W. W. and Stair, R.
Transmissive properties of eye-protective glasses and other substances.
Tech. Pap. Bur. Stand. 22, 555 (1927-28) T369.
154. McNicholas, H. J.
Absolute methods in reflectometry.
J. Res. Nat. Bur. Stand. 1, 29 (1928) RP3.
155. Bruce, H. D.
Tinting strength of pigments.
J. Res. Nat. Bur. Stand. 1, 125 (1928) RP7.
156. Judd, Deane B.
Effect of temperature change on the color of red and yellow Lovibond glasses.
J. Res. Nat. Bur. Stand. 1, 859 (1928) RP31.
157. McNicholas, H. J.
Use of the under-water spark with the Hilger sector photometer in ultra-violet spectrophotometry.
J. Res. Nat. Bur. Stand. 1, 939 (1928) RP33.
158. Skogland, J. F.
Tables of spectral energy distribution and luminosity for use in computing light transmissions and relative brightnesses from spectrophotometric data.
Misc. Pub. Bur. Stand. No. 86 (1929) M86.
159. Brode, Wallace R.
The spectral absorption of certain monoazo dyes. I. The effect of position isomerism on the spectral absorption of methyl derivatives of benzeneazophenol.
J. Res. Nat. Bur. Stand. 2, 501 (1929) RP47.
160. Jones, L. A.
Chairman, Optical Society of America Committee on Standard of Photographic Intensity, Report on resolutions dealing with the photographic unit of intensity presented at the 7th Intern. Cong. of Photography.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 162 (1929). (Abstract).
161. McNicholas, H. J.
Apparatus for the measurement of the reflective and transmissive properties

- of diffusing media.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 165 (1929). (Abstract).
162. Gibson, K. S.
Apparatus for accurate and rapid measurement of spectral transmission and reflection.
J. Opt. Soc. Amer. and Rev. Sci. Instr. 18, 166 (1929). (Abstract).
163. McNicholas, H. J.
The absorptive properties of carotin and xanthophyll in the visible and ultraviolet.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 172 (1929). (Abstract).
164. Judd, Deane B.
Least retinal illumination by spectral light required to evoke the "blue arcs of the retina".
J. Res. Nat. Bur. Stand. 2, 441 (1929) RP43; J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 172 (1929).
165. Priest, Irwin G., Judd, Deane B., Gibson, K. S. and Walker, Geraldine K.
Calibration of sixty-five 35-yellow Lovibond glasses.
J. Res. Nat. Bur. Stand. 2, 793 (1929) RP58.
166. Gibson, K. S. and Davis, Raymond.
Methods for determining the color of sunlight and daylight.
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 442 (1929). (Abstract).
168. Crittenden, E. C. and Taylor, A. H.
An interlaboratory comparison of colored photometric filters.
Trans. Illum. Eng. Soc. 24, 153 (1929).
169. Judd, Deane B.
Review of Ladd-Franklin's "Colour and Colour Theories".
J. Opt. Soc. Amer. and Rev. Sci. Instrum. 19, 103 (1929).
170. Thompson, G. W.
The true tinting strength of white pigments.
Proc. Amer. Soc. Test. Mater. 29, 924 (1929) (Part II).
171. Peters, H. H. and Phelps, F. P.
A technical method of using the mercury arc to obtain data at wave length 560mu in the spectrophotometric analysis of sugar products.
J. Res. Nat. Bur. Stand. 2, 335 (1929) RP38.
172. Appel, W. D.
Quantitative relation between the spectral reflection of textile dyeings and the amount of dye used.
Text. Res. Council, Statler Building, Boston, Mass. (1929).
173. Jones, L. A.
Chairman, Optical Society of America Committee on the unit of photographic intensity, Report.
Proc. 7th Intern. Cong. of Photography, London, 1928 (W. Heffer and Sons, Ltd., Cambridge, Eng.), p. 152, 1929.
174. Judd, Deane B.
Reduction of data on mixture of color stimuli.
J. Res. Nat. Bur. Stand. 4, 515 (1930) RP163; J. Opt. Soc. Amer. and Rev. Sci. Instrum. 18, 441 (1930).
175. Priest, Irwin G. and Riley, J. O.
The selective reflectance of magnesium oxide.
J. Opt. Soc. Amer. 20, 156 (1930).
176. Priest, Irwin G.
Note on the yellowness of commercial magnesium carbonate and the alleged yellowness of magnesium oxide.
J. Opt. Soc. Amer. 20, 157 (1930).
177. Judd, Deane B.
Thomas Young's theory of color vision and the hue change by addition of white light.
J. Opt. Soc. Amer. 20, 156 (1930). (Abstract).
178. Priest, Irwin G.
Note on the relative sensitiveness of direct color comparison and spectrophotometric measurements in detecting slight differences in the spectral distribution of light.
J. Opt. Soc. Amer. 20, 159 (1930).
179. Judd, Deane B.
Precision of color temperature measurements under various observing conditions; a new color comparator for incandescent lamps.
J. Res. Nat. Bur. Stand. 5, 1161 (1930) RP252; J. Opt. Soc. Amer. 21, 145 (1931).
180. Judd, Deane B.
The mixture data embodied in the tentative curves of Hecht's theory of vision.
J. Opt. Soc. Amer. 20, 647 (1930).

181. Gibson, K. S.
The use of the photoelectric cell in spectrophotometry. Photoelectric cells and their applications. (The Physical and Optical Societies, London, England; also obtainable from Adam Hilger, Ltd., London), p. 157 (1930).
182. Davis, Raymond and Gibson, K. S.
Filters for the reproduction of sunlight and daylight and the determination of color temperature. Misc. Pub. Bur. Stand. No. 114 (1931) M114.
183. Gibson, K. S.
An illumination sphere for reflectometry and photoelectric spectrophotometry. J. Opt. Soc. Amer. 21, 144 (1931). (Abstract).
184. Judd, Deane B.
Extension of the standard visibility function to intervals of 1 millimicron by third-difference osculatory interpolation. J. Res. Nat. Bur. Stand. 6, 465 (1931) RP289; J. Opt. Soc. Amer. 21, 267 (1931).
185. Judd, Deane B.
Comparison of distribution curves embodying Wright's recent results with the OSA "excitation" curves. J. Opt. Soc. Amer. 21, 434 (1931). (Abstract).
187. Judd, Deane B.
A new set of distribution curves for use in colorimetric computation. J. Opt. Soc. Amer. 21, 436 (1931). (Abstract).
189. Judd, Deane B.
Interpolation of the OSA "excitation" data by the fifth-difference osculatory formula. J. Res. Nat. Bur. Stand. 7, 85 (1931) RP334; J. Opt. Soc. Amer. 21, 531 (1931).
190. Gibson, K. S.
Spectrophotometry at the Bureau of Standards. J. Opt. Soc. Amer. 21, 564 (1931).
191. McNicholas, H. J.
The visible and ultraviolet absorption spectra of carotin and xanthophyll and the changes accompanying oxidation. J. Res. Nat. Bur. Stand. 7, 171 (1931) RP337.
192. Gibson, K. S.
Chairman, Optical Society of America Committee on the photographic standard of intensity, Report on the photographic unit of intensity. J. Opt. Soc. Amer. 21, 654 (1931); see also Bericht VIII. Internationalen Kongress Photographie, Dresden, 1931 (J. A. Barth, Leipzig, Germany), p. 84 and 424 (1932).
193. Judd, Deane B.
Comparison of Wright's data on equivalent color stimuli with the OSA data. J. Opt. Soc. Amer. 21, 699 (1931).
194. Davis, Raymond
A correlated color temperature for illuminants. J. Res. Nat. Bur. Stand. 7, 659 (1931) RP365.
195. Davis, Raymond and Gibson, K. S.
The relative spectral energy distribution and correlated color temperature of the NPL white-light standard. J. Res. Nat. Bur. Stand. 7, 791 (1931) RP374.
196. Judd, Deane B.
A general formula for the computation of colorimetric purity. J. Res. Nat. Bur. Stand. 7, 827 (1931) RP377; J. Opt. Soc. Amer. 21, 729 (1931).
197. Colors for sanitary ware. Commer. Stand. Nat. Bur. Stand. No. 30 (1931); CS30-31.
198. Judd, Deane B.
Chromaticity sensibility to temperature change as a function of color temperature. J. Opt. Soc. Amer. 22, 9 (1932). (Abstract).
199. Judd, Deane B.
Chromaticity sensibility to stimulus differences. J. Opt. Soc. Amer. 22, 72 (1932).
200. A report on the spectral reflection of eleven samples of dyed cloth (B. S. Test 64397). Amer. Dyest. Rep. 21, 163 (1932).
201. Helson, Harry and Judd, Deane B.
A study in photopic adaptation. J. Exp. Psychol. 15, 380 (1932).
202. Judd, Deane B.
Progress report from the United States of America (Resume of progress in colorimetry since 1927 in America). Proc. of the Intern. Comm. on Ill., 8th Meeting, Cambridge, 1931

- (University Press, Cambridge, England), 213. p. 658 (1932).
203. Judd, Deane B.
Nearest color temperature for stimuli yielding non-Planckian but nearly achromatic colors.
J. Opt. Soc. Amer. 22, 428 (1932).
(Abstract).
 204. Judd, Deane B.
Investigation of sources of errors in color temperature determinations of incandescent lamps.
J. Opt. Soc. Amer. 22, 429 (1932).
(Abstract).
 205. Priest, Irwin G.
Report on the work of the Colorimetry Committee of the International Commission on Illumination and the actions taken at the meeting in Cambridge, England, September, 1931.
J. Opt. Soc. Amer. 22, 431 (1932).
(Abstract).
 206. Kasper, Charles
The structure of the chromic-acid plating bath; the theory of chromium deposition.
J. Res. NBS 9, 353 (1932) RP476.
 207. Judd, Deane B.
Sensibility to color-temperature change as a function of temperature.
J. Opt. Soc. Amer. 23, 7 (1933).
 208. Tyndall, E.P.T.
Chromaticity sensibility to wave-length difference as a function of purity.
J. Opt. Soc. Amer. 23, 15 (1933).
 209. Judd, Deane B.
Saturation scale for yellow colors.
J. Opt. Soc. Amer. 23, 35 (1933).
 210. Priest, Irwin G.
A proposed scale for use in specifying the chromaticity of incandescent illuminants and various phases of daylight.
J. Opt. Soc. Amer. 23, 41 (1933).
 212. Judd, Deane B.
Computation from spectrophotometric data of trilinear coordinates, dominant wave-length, colorimetric purity and relative brightness on the 1931 CIE basis.
J. Opt. Soc. Amer. 23, 194 (1933).
(Abstract).
 213. Gibson, K. S.
Transmissions de quatre verres bleus destinés a etre employés comme étalons photométrique internationaux.
Com. Int. des Poids et Mesures, Procès-verbaux des séances, Vol. XVI, Annexes du Com. Consultatif d'Elect. et de Phot., No. 40, p. 307, 1933.
 214. Gibson, K. S. and Walker, Geraldine K.
Standardization of railway signal glasses - Reports on measurements and investigations undertaken by the Colorimetry Section of the Bureau of Standards at the request of the Signal Section of the American Railway Association.
Signal Section Proceedings, ARA 30, 384 (1933).
 215. Gibson, K. S.
Report No. 1. The transmission (ARA scale) of 36 specimens of signal glass relative to transmission of 6 ARA standards marked "J. C. Mock 10/3/30", a report on measurements made at Corning Glass Works, December 9-11, 1930. (See 214).
 216. Gibson, K. S. and Walker, Geraldine K.
Report No. 2. Measurements of spectral and luminous transmissions leading to the derivation of new ARA transmissions for the 36 glasses listed in Report No. 1. (See 214).
 217. Walker, Geraldine K. and Gibson, K. S.
Report No. 3. Spectral and luminous transmissions and derivation of new values of ARA transmission for the 22 "limit" glasses selected by Committee VI, ARA, at Corning, Nov. 5-6, 1931 and engraved "J.C.M. 11-6-31". (See 214).
 219. Gibson, K. S. and Walker, Geraldine K.
Report 4. Chromaticities and luminous transmissions, with illuminants at 1,900°K and 2,848°K, for the 22 "limit" glasses described in Report No. 3. (See 214).
 220. Gibson, K. S.
Report No. 5. Tentative specifications for railway signal colors. (See 214).
 221. Judd, Deane B.
The 1931 ICI standard observer and coordinate system for colorimetry.
J. Opt. Soc. Amer. 23, 359 (1933).

222. Stair, R. and Coblenz, W. W.
Infrared absorption spectra of some
plant pigments.
J. Res. Nat. Bur. Stand. 11, 703
(1933) RP 617.
223. Becker, Genevieve and Appel, W. D.
Evaluation of manila-rope fiber for
color.
J. Res. Nat. Bur. Stand. 11, 811 (1933)
RP627.
224. Becker, Genevieve
Spectral reflectance of the Philippine
Island Government standards for abaca
fiber.
J. Res. Nat. Bur. Stand. 11, 823 (1933)
RP628.
225. Davis, Raymond and Gibson, K. S.
Filters for producing the color of the
equal-energy stimulus.
J. Res. Nat. Bur. Stand. 12, 263 (1934)
RP652. The filters are of the type
described in 182, 195, 444.
226. Wensel, H. T., Judd, D. B. and
Roeser, Wm. F.
The establishment of a color-tempera-
ture scale.
J. Opt. Soc. Amer. 24, 55 (1934);
J. Res. Nat. Bur. Stand. 12, 527 (1934)
RP677.
227. Gibson, K. S. and Walker, Geraldine K.
Standardization and specification of
railway signal colors.
J. Opt. Soc. Amer. 24, 57 (1934).
(Abstract).
228. Gibson, K. S., Walker, Geraldine K.
and Brown, Mabel E.
Filters for testing the reliability
of spectrophotometers.
J. Opt. Soc. Amer. 24, 58 (1934).
(Abstract). (See also 404, 424, C484).
229. Walker, Geraldine K.
Statistical investigation of the
uniformity of grades of 1,000 Lovibond
red glasses.
J. Res. Nat. Bur. Stand. 12, 269 (1934)
RP653.
230. Judd, Deane B.
Sources of error in measuring opacity
of paper by the contrast-ratio method.
J. Res. Nat. Bur. Stand. 12, 345 (1934)
RP660.
232. Gibson, K. S. and Walker, Geraldine K.
Standardization of Lovibond red glasses.
J. Opt. Soc. Amer. 24, 163 (1934).
(Abstract).
233. Gibson, K. S.
Visual spectrophotometry.
J. Opt. Soc. Am. 24, 234 (1934).
(See 288).
234. Wensel, H. T., Roeser, Wm. F.,
Barbrow, L. E. and Caldwell, F. R.
Derivation of photometric standards
for tungsten-filament lamps.
J. Res. Nat. Bur. Stand. 13, 161
(1934) RP699.
235. McNicholas, H. J.
Equipment for measuring the reflective
and transmissive properties of diffusing
media.
J. Res. Nat. Bur. Stand. 13, 211 (1934)
RP704.
236. Judd, Deane B.
Opacity standards.
J. Res. Nat. Bur. Stand. 13, 281 (1934)
RP709; Pap. Trade J., Tech. Sec. 100,
4 (1935).
237. Gibson, Kasson S. and Haupt, Geraldine
Walker.
Standardization of Lovibond red glasses
in combination with Lovibond 35 yellow.
J. Res. Nat. Bur. Stand. 13, 433 (1934)
RP718; Oil Soap 11, 246 (1934).
238. Judd, Deane B.
A Maxwell triangle yielding uniform
chromaticity scales.
J. Res. Nat. Bur. Stand. 14, 41 (1935)
RP756; J. Opt. Soc. Amer. 25, 24 (1935).
239. Judd, Deane B.
Surface color.
J. Opt. Soc. Amer. 25, 44 (1935).
(Abstract).
240. Gibson, Kasson S.
A filter isolating 560 mu.
J. Opt. Soc. Amer. 25, 46 (1935).
(Abstract).
241. Gibson, Kasson S.
A filter for obtaining light at wave-
length 560 mu.
J. Res. Nat. Bur. Stand. 14, 545 (1935)
RP785; J. Opt. Soc. Amer. 25, 131 (1935).
242. Judd, Deane B.
Estimation of chromaticity differences
and nearest color temperature on the
standard 1931 ICI colorimetric coordinate
system.
J. Opt. Soc. Amer. 25, 199 (1935).
(Abstract).

243. Judd, Deane B.
A method for determining whiteness of paper.
Pap. Trade J., Tech. Sec. 100, 266 (1935); Tech. Ass. Pap., Series 18, 392 (1935).
244. Appel, Wm. D.
Fading of dyeings in radiation of different intensities.
Amer. Dyest. Rep. 24, 306 (1935).
245. Hunter, Richard S.
Reflection measurements on pulp and paper.
Pap. Trade J., Tech. Sec. 100, 333 (1935); Tech. Ass. Pap., Series 18, 405 (1935).
246. Colors and finishes for cast stone.
Commer. Stand. Nat. Bur. Stand. No. 53, 1935; SC53-35.
247. Brewster, Joseph F.
Simplified apparatus for technical sugar colorimetry.
J. Res. Nat. Bur. Stand. 16, 349 (1936) RP878.
248. Judd, Deane B.
The dependence of reflectance and opacity on thickness; relation between contrast ratio and printing opacity.
Pap. Trade J., Tech. Sec. 101, 58 (1935); Tech. Ass. Pap., Series 18, 441 (1935).
249. Gill, L. M.
Chairman, Amer. Oil Chem. Soc., Color glass development committee Report.
Oil Soap 12, 153 (1935).
250. McNicholas, Harry J.
Color and spectral transmittance of vegetable oils.
J. Res. Nat. Bur. Stand. 15, 99 (1935) RP815; Oil Soap 12, 167 (1935).
251. Stair, R. and Coblentz, W. W.
Infrared absorption spectra of plant and animal tissue and of various other substances.
J. Res. Nat. Bur. Stand. 15, 295 (1935) RP830.
252. Priest, Irwin G.
The Priest-Lange reflectometer applied to nearly white porcelain enamels.
J. Res. Nat. Bur. Stand. 15, 529 (1935) RP847; Amer. Enameler 8, No. 11, 3 and 9, No. 1, 5 (1936).
253. Judd, Deane B. and Gibson, K. S.
Note on the effect of a cover glass in reflectance measurements.
J. Res. Nat. Bur. Stand. 16, 261 (1936) RP872.
254. Hunter, Richard S.
Gloss investigations using reflected images of a target pattern.
J. Res. Nat. Bur. Stand. 16, 359 (1936) RP879; J. Opt. Soc. Amer. 26, 190 (1936); Sci. Sect. Nat. Paint, Varn. and Lacquer Ass., Inc., Circular No. 503, April, 1936.
255. Coblentz, W. W. and Stair, R.
Distribution of the energy in the extreme ultraviolet of the solar spectrum.
J. Res. Nat. Bur. Stand. 17, 1 (1936) RP899.
256. Judd, Deane B. and Harrison, W. N.
The specification of light-scattering materials.
Bull. Amer. Ceram. Soc. 15, 78 (1936) (Abstract).
257. Judd, Deane B.
A method for determining whiteness of paper, II.
Pap. Trade J., Tech. Sec. 103, 154 (1936); Tech. Ass. Pap., Series 19, 359 (1936).
258. Terms used in radiation measurements.
Rev. Sci. Instrum. 7, 322 (1936).
259. Hunter, Richard S.
Identification of five different types of gloss effects.
J. Opt. Soc. Amer. 26, 224 (1936); Bull. Amer. Ceram. Soc. 15, 78 (1936); see also Bull. Amer. Soc. Test. Mater., p. 18 (April 1936). (Abstract).
260. Judd, Deane B.
A subtractive colorimeter for the measurement of small chromaticity differences between surfaces of moderate spectral selectivity of reflectance.
J. Opt. Soc. Amer. 26, 225 (1936). (Abstract).
261. Hunter, Richard S.
A null method photoelectric reflectometer.
J. Opt. Soc. Amer. 26, 225 (1936); Bull. Amer. Ceram. Soc. 15, 79 (1936); Better Enameling 7, No. 3, 12 (1936). (Abstract).

262. Gibson, Kasson S., Haupt, Geraldine Walker and Keegan, Harry J. Standardization and specification of railway signal colors. J. Opt. Soc. Amer. 26, 226 (1936). (Abstract).
263. Hunter, Richard S. The estimation of gloss with a luminous target. J. Opt. Soc. Amer. 26, 304 (1936). (Abstract).
264. Judd, Deane B. Calibration and use of a subtractive colorimeter for small chromaticity differences on the standard ICI system. J. Opt. Soc. Amer. 26, 304 (1936). (Abstract).
265. Judd, Deane B. Changes in color temperature of tungsten-filament lamps at constant voltage. J. Res. Nat. Bur. Stand. 17, 679 (1936) RP937; J. Opt. Soc. Amer. 26, 409 (1936) and 27, 74 (1937).
266. Judd, Deane B. Color-blindness and anomalies of vision. J. Soc. Motion Pict. Eng. 26, 616 (1936).
268. Judd, Deane B. Estimation of chromaticity differences and nearest color temperature on the standard 1931 ICI colorimetric coordinate system. J. Res. Nat. Bur. Stand. 17, 771 (1936) RP944; J. Opt. Soc. Amer. 26, 421 (1936).
269. Helson, Harry and Judd, D. B. An experimental and theoretical study of changes in surface colors under changing illuminations. Psychol. Bull. 33, 740 (1936). (Abstract).
270. Pharmacy seeks new system of naming colors. Druggists Cir., p. 31 (Jan. 1937). (KLK).
271. Gibson, Kasson S. Photoelectric photometers and colorimeters. Instruments 9, 309, 335 (1936).
272. McNicholas, Harry J. Selection of colors for signal lights. J. Res. Nat. Bur. Stand. 17, 955 (1936) RP956.
273. Hunter, Richard S. Methods of determining gloss. J. Res. Nat. Bur. Stand. 18, 19 (1937) RP958; Proc. Amer. Soc. Test. Mater. (Part II) 36, 783 (1936).
274. Gibson, Kasson S. and Keegan, Harry J. The color of water. J. Opt. Soc. Amer. 27, 58 (1937). (Abstract).
275. Hunter, Richard S. Goniophotometric data on gloss differences. J. Opt. Soc. Amer. 27, 59 (1937). (Abstract).
276. Haupt, Geraldine Walker Statistical investigation of the uniformity of grades of Lovibond red glasses. J. Opt. Soc. Amer. 27, 63 (1937). (Abstract).
277. Harrison, W. N. Chairman, Porcelain Enamel Institute Committee on standardization of tests, Reflectance test of opaque white porcelain enamels (Technical Research Section, Educational Bureau, Porcelain Enamel Institute, Inc.), March 1937.
278. Jones, Lloyd A. Colorimetry: Preliminary draft of a report on nomenclature and definitions. J. Opt. Soc. Amer. 27, 207 (1937).
279. Judd, Deane B. Note on choice of apertures in the definitions of specular gloss and contrast gloss. J. Opt. Soc. Amer. 27, 225 (1937). (Abstract).
280. Hunter, Richard S. Problems in the development of a multiple-purpose reflectometer. J. Opt. Soc. Amer. 27, 225 (1937); Bull. Amer. Ceram. Soc. 16, 90 (1937). (Abstract).
282. Gibson, K. S. The analysis and specification of color. J. Soc. Motion Pict. Eng. 28, 388 (1937).
283. Gibson, Kasson S. Review of Hardy's "Handbook of Colorimetry". Science 85, 545 (1937).
284. Colors for kitchen accessories. Commer. Stand. Nat. Bur. Stand. No. 62 (1937); CS62-38.

285. Colors for bathroom accessories. Comm. Stand. Nat. Bur. Stand. No. 63 (1937); CS63-38.
286. Judd, Deane B. with Harrison, W. N., Sweo, B. J., Hickson, E. F., Eickhoff, A. J., Shaw, Merle B. and Paffenbarger, George C. Optical specification of light-scattering materials. J. Res. Nat. Bur. Stand. 19, 287 (1937) RP1026; abridged copy for paper industry published in Pap. Trade. J., Tech. Sec. 106, 5 (1938); Tech. Ass. Pap., Series 21, 474 (1938).
287. Gibson, Kasson S. Note on the spectrophotometric grading of vegetable oils on the N'' Lovibond scale. Oil Soap 14, 286 (1937).
288. Gibson, Kasson S. Spectrophotometry. Measurement of radiant energy, edited by W. E. Forsythe (McGraw-Hill Book Co., Inc., New York and London, 1937), Chap. XI, p. 326. (Essentially same as 233).
289. Hunter, Richard S. Precision and accuracy of apparent reflectance measurements with a photoelectric illumination meter. J. Opt. Soc. Amer. 28, 51 (1938). (Abstract).
290. Hunter, Richard S. Development of filters for tri-stimulus and luminosity measurements with barrier-layer photo-cells. J. Opt. Soc. Amer. 28, 51 (1938). (Abstract).
291. Judd, Deane B. Uniform tolerances for surface-color specification. J. Opt. Soc. Amer. 28, 52 (1938). (Abstract).
292. Crittenden, E. C. A new system of photometric units. J. Opt. Soc. Amer. 28, 53 (1938). (Abstract).
293. Judd, D. B., Harrison, W. N. and Sweo, B. J. Optical specification of vitreous enamels. J. Amer. Chem. Soc. 21, 16 (1938).
294. Judd, Deane B. and Kelly, Kenneth L. Scientific color naming of drugs. J. Amer. Pharm. Ass. 27, 208 (1938).
295. Gibson, Kasson S., Teele, Ray P. and Keegan, Harry J. A new luminosity filter. J. Opt. Soc. Amer. 28, 178 (1938). (Abstract).
296. Hunter, Richard S. Further study of the use of filters and barrier-layer photocells for tristimulus colorimetry. J. Opt. Soc. Amer. 28, 179 (1938). (Abstract).
297. Gibson, Kasson S. and Keegan, Harry J. On the magnitude of the error resulting from fluorescence in spectrophotometric measurements. J. Opt. Soc. Amer. 28, 180 (1938). (Abstract).
298. Priest, Irwin G. and Brickwedde, Ferdinand G. Minimum perceptible colorimetric purity as a function of dominant wave length. J. Res. Nat. Bur. Stand. 20, 673 (1938) RP1099; J. Opt. Soc. Amer. 28, 133 (1938).
- 298a. Coblentz, W. W. and Stair, R. Spectral-transmissive properties and use of colored eye-protective glasses. NBS Circ. 421 (June 1938). See C471
299. Judd, Deane B. Review of Vernon W. Grant's "Psychological Optics". Rev. Sci. Instrum. 9, 301 (1938).
300. Schoonover, I. C. and Sweeney, W. T. Some properties of two types of resins used for dentures. J. Amer. Dent. Ass. Dent. Cosmos 25, 1487 (1938).
301. Gibson, Kasson S. and Keegan, Harry J. Calibration and operation of the General Electric Recording Spectrophotometer of the National Bureau of Standards. J. Opt. Soc. Amer. 28, 372 (1938).
302. Judd, Deane B. Inter-Society Color Council. Bull. Amer. Ceram. Soc. 17, 379 (1938).
303. Judd, Deane B. Designation of filters for theatrical lighting. J. Opt. Soc. Amer. 28, 390 (1938).
304. Haupt, Geraldine Walker. Departures from additivity among Lovibond red glasses in combination with Lovibond 35 yellow. Oil and Soap 15, 282 (1938).

305. Coblentz, W. W. and Stair, R.
Note on the spectral reflectivity of rhodium.
J. Res. Nat. Bur. Stand. 22, 93 (1939)
RP1168.
306. Gibson, K. S., Haupt, Geraldine Walker and Keegan, H. J.
Standardization of railway signal glasses -- Reports on measurements and investigations undertaken by the Colorimetry Section of the National Bureau of Standards at the request of the Signal Section, AAR, Signal Section Proceedings, AAR. 36, 136 (1939).
307. Report No. 6. Examination of 65 duplicate limit glasses. (See 306). (KSG and GWH).
308. Report No. 7. Colorimetric data leading to specification 59-38 for kerosene hand lantern globes; comparison of specifications 59-38, 69-38 and 69-35; certification of duplicate lantern glasses. (See 306). (KSG & GWH).
309. Hunter, Richard S. and Judd, Deane B.
Development of a method of classifying paints according to gloss.
Bull. Amer. Soc. Test. Mater. (260 S. Broad Street, Philadelphia, Pa.) No. 97, 11 (1939); Paint and Varnish Production (Manager (Mills Building, Washington, D.C.) 19, 152 (1939). (KSG & GWH).
310. Crittenden, E. C.
Terminology and standards of illumination.
J. Opt. Soc. Amer. 29, 103 (1939).
311. Judd, Deane B.
The Inter-Society Color Council tentative system of color names.
J. Opt. Soc. Amer. 29, 142 (1939). (Abstract).
312. Gibson, Kasson S., Teele, Ray P. and Keegan, Harry J.
An improved luminosity filter.
J. Opt. Soc. Amer. 29, 144 (1939). (Abstract).
313. Judd, Deane B.
Definition of artificial daylight.
J. Opt. Soc. Amer. 29, 144 (1939). (Abstract).
314. Judd, Deane B.
Definition and tolerances for artificial daylight for color matching.
J. Opt. Soc. Amer. 29, 145 (1939). (Abstract).
315. Hunter, Richard S.
Progress in developing a photo-electric method for measuring color difference.
Bull. Amer. Ceram. Soc. 18, 121 (1939). (Abstract).
316. Gibson, K. S. and Hickson, E. F.
Report on the measurement and specification of the color designated as National School Bus Chrome (1939).
(Professor Frank W. Cyr, Chairman, Nat. Con. School Bus Standards, Teachers College, Columbia University, New York, N. Y.). (See 434 and 436).
317. Gathercoal, E. N.
Color names in the botanical, chemical and pharmaceutical monographs.
Bull. Nat. Formulary Comm. 7, 269 (1939).
318. Gibson, Kasson S. and Haupt, Geraldine Walker.
Standardization of the luminous-transmission scale used in the specification of railroad signal glasses.
J. Res. Nat. Bur. Stand. 22, 627 (1939)
RP1209; J. Opt. Soc. Amer. 29, 188 (1939).
319. MacAdam, Dunlap J., Jr. and Geil, Glenn W.
Rate of oxidation of steels as determined from interference colors of oxide films.
J. Res. Nat. Bur. Stand. 23, 63 (1939)
RP1221.
320. Judd, Deane B.
Specification of uniform color tolerances for textiles.
Text. Res. (65 Franklin Street, Boston, Mass.) 9, 253 and 292 (1939).
321. Judd, Deane B.
Specification of color tolerances at the National Bureau of Standards.
Amer. J. Psychol. (Morrill Hall, Cornell Univ., Ithaca, New York) 52, 418 (1939); J. Opt. Soc. Amer. 29, 264 (1939). (Abstract).
322. Judd, Deane B.
The physics of color tolerance.
Amer. Dyest. Rep. (Amer. Ass. of Textile Chem. and Colorists, 440 Fourth Avenue, New York, N. Y.) 28, 441 (1939); J. Opt. Soc. Amer. 29, 261 (1939). (Abstract).

- 322a. Breckenridge, F. C. and Schaub, W. R. Rectangular uniform-chromaticity-scale coordinates. J. Opt. Soc. Amer. 29, 370 (1939).
323. Judd, Deane B. and Kelly, Kenneth L. Method of designating colors. J. Res. Nat. Bur. Stand. 23, 355 (1939) RP1239.
324. Hoffman, James I. and Lundell, G.E.F. Separation and colorimetric determination of Rhenium and Molybdenum. J. Res. Nat. Bur. Stand. 23, 497 (1939) RP1248.
325. Scientific naming of colors in the U.S.P. and N.F. monographs. Bull. Nat. Formulary Comm. 8, 17 (1939). (KLK).
326. Gibson, Kasson S. Spectral luminosity factors. J. Opt. Soc. Amer. 30, 51 (1940).
327. Gibson, Kasson S. Approximate spectral energy distribution of skylight. J. Opt. Soc. Amer. 30, 88 (1940). (Abstract).
328. Kelly, Kenneth L. Scientific color names in the USP and NF. USP Cir. 24, p. 55-V (1940).
- 328a. Institute of traffic Engineers, Standards of the, Adjustable Face Control Signal Head Standards, Tech. Report No. 1, 1940 Proceedings. (KSG).
329. Judd, Deane B. Hue, saturation and lightness of surface colors with chromatic illumination. J. Res. Nat. Bur. Stand. 24, 293 (1940) RP1285; J. Opt. Soc. Amer. 30, 1 (1940).
330. Hunter, Richard S. Sources of error in operation of the multipurpose reflectometer. J. Opt. Soc. Amer. 30, 89 (1940). (Abstract).
331. Hunter, R. S. Correction of multipurpose reflectometer data. Bull. Amer. Ceram. Soc. 19, 132 (1940). (Abstract).
332. Hunter, Richard S. Further progress in developing a photoelectric method for measuring color difference. Bull. Amer. Ceram. Soc. 19, 133 (1940). (Abstract).
333. Hunter, Richard S. Applications and accuracy of three-filter photoelectric colorimetry. J. Opt. Soc. Amer. 30, 272 (1940). (Abstract).
334. Gathercoal, E. N. and Kelly, Kenneth L. General notice on color terms. Bull. Nat. Formulary Comm. 8, 201 (1940).
335. Kelly, Kenneth L. A preliminary report on the suitability of the Hunter multi-purpose reflectometer for color measurement of near whites. Bull. Nat. Formulary Comm. 8, 229 (1940).
336. Gibson, Kasson S. Survey of spectrophotometers. Tech. Ass. Papers 23, 475(1940); Pap. Trade J., Tech. Sec. 111, 135 (1940); J. Opt. Soc. Amer. 30, 272 (1940).
337. Judd, Deane B. Systematic color designations for paper. Pap. Trade J., Tech. Sec. 111, 201 (1940); Tech. Ass. Pap. 23, 512 (1939).
338. Judd, Deane B. and Lewis, Lester C. Introductory dialogue (for a symposium on spectrophotometry in the pulp and paper industries). Tech. Ass. Pap. 23, 473, 477, 479, 489, 490, 493, 499 and 505 (1940); Pap. Trade J., Tech. Sec. 111, 133, 137, 141, 151, 155, 165, 183 and 193 (1940); J. Opt. Soc. Amer. 30, 272 (1940). (Abstract).
339. Kelly, Kenneth L. Instructions for determining the color names for drugs and chemicals. Bull. Nat. Formulary Comm. 8, 359 (1940).
340. Judd, Deane B. The Munsell Color System, Foreword. J. Opt. Soc. Amer. 30, 574 (1940).
341. Hunter, Richard S. A multipurpose photoelectric reflectometer. J. Res. Nat. Bur. Stand. 25, 581 (1940) RP1345; J. Opt. Soc. Amer. 30, 536 (1940).
342. Gibson, Kasson S. and Nickerson, Dorothy. An analysis of the Munsell Color System based on measurements made in 1919 and 1926. J. Opt. Soc. Amer. 30, 591 (1940).

343. Hunter, Richard S.
Photoelectric colorimetry.
Bull. Amer. Soc. Test. Mater. No. 108,
13 (Jan. 1941).
344. Judd, Deane B.
Introduction to color.
Part of Symposium on Color, pub. by
the Amer. Soc. Test. Mater.,
Mar. 5, 1941.
345. Judd, Deane B.
Introduction to color.
Bull. Amer. Soc. Test. Mater. No. 108,
11 (1941).
346. Wood, Lawrence A.
The optical properties of rubber.
J. Appl. Phys. 12, 119 (1941).
347. Hunter, Richard S.
Examples of color measurements with
the multipurpose reflectometer and
tristimulus filters.
Bull. Amer. Ceram. Soc. 20, 91 (1941).
348. Moore, Dwight G. and Hunter, Richard S.
Use of liquid surfaces as standards of
specular gloss.
J. Amer. Ceram. Soc. 24, 167 (1941).
349. Judd, Deane B.
Color systems and their inter-relation.
Illum. Eng. 36, 336 (1941).
350. Judd, Deane B.
The definition of black and white.
Amer. J. Psychol. 54, 289 (1941).
351. Hague, John L. and Bright, Harry A.
Colorimetric determination of
phosphorus in steel and cast iron.
J. Res. Nat. Bur. Stand. 26, 405
(1941) RP1386.
352. Scofield, Francis, Judd, Deane B. and
Hunter, Richard S.
A proposed method of designating color.
Bull. Amer. Soc. Test. Mater. No. 110,
p. 19 (May 1941).
353. Rodden, Clement J.
Spectrophotometric determination of
praseodymium, neodymium and samarium.
J. Res. Nat. Bur. Stand. 26, 557 (1941)
RP1395.
354. Gibson, Kasson S. and Keegan, Harry J.
Use of didymium glasses for wave-
length calibration of recording
spectrophotometers.
J. Opt. Soc. Amer. 31, 462 (1941).
(Abstract).
355. Judd, Deane B.
Whiteness of light surface-colors.
J. Opt. Soc. Amer. 31, 462 (1941).
(Abstract).
356. Hunter, Richard S.
Permissible short cuts in the
photoelectric tristimulus measurement
of color difference.
J. Opt. Soc. Amer. 31, 463 (1941).
(Abstract).
357. Teele, Ray P.
A physical photometry.
J. Res. Nat. Bur. Stand. 27, 217
(1941) RP1415; J. Opt. Soc. Amer. 31,
696 (1941).
358. Judd, Deane B.
Methods of designating color.
Bull. Amer. Ceram. Soc. 20, 375 (1941).
359. Kelly, Kenneth L.
The success of the ISCC-NBS system of
color names in the Chemical Monographs.
Bull. Nat. Formulary Comm. 9, 302 (1941).
360. Launer, Herbert F.
Reflection-transmission relationships
in sheet materials.
J. Res. Nat. Bur. Stand. 27, 429 (1941)
RP1430.
361. Wingfield, Baker and Acree, S. F.
Effects of hydrochloric acid and salts
on the absorption of light by b-
naphthoquinonesulfonic acid.
J. Res. Nat. Bur. Stand. 27, 361 (1941)
RP1424.
362. Beek, John, Jr.
The carbohydrate content of collagen.
J. Res. Nat. Bur. Stand. 27, 507 (1941)
RP1438.
363. Hunter, Richard S.
The accurate measurement of specular
gloss.
J. Opt. Soc. Amer. 31, 758 (1941).
(Abstract).
364. Judd, Deane B.
Colorimetry of pulp and paper with
special reference to "Brightness" and
"Whiteness".
Pulp Pap. Mag. Can. 43, No. 2, 94
(1942).
365. Crittenden, E. C.
Chairman, Illuminating Engineering
Nomenclature and Photometric Standards.
American Standard, approved February 27,
1942 by American Standards Association,
ASA Z7.1-1942. Prepared under the

- direction of and issued by The Illuminating Engineering Society. Pub. also as Report of IES Committee on Nomenclature and Standards. Illum. Eng. 36, 813 (1941).
366. Rodden, Clement J.
Spectrophotometric determination of dysprosium, holmium, erbium, thulium, and ytterbium.
J. Res. Nat. Bur. Stand. 28, 265 (1942) RP1456.
367. MacAdam, Dunlap J., Jr. and Geil, Glenn W.
Rate of oxidation of typical nonferrous metals as determined by interference colors of oxide films.
J. Res. Nat. Bur. Stand. 28, 593 (1942) RP1470.
368. Eickhoff, Arnold J. and Hunter, Richard S.
Measurement of the fading rate of paints.
J. Res. Nat. Bur. Stand. 28, 773 (1942) RP1478; Paint, Oil Chem. Rev. 104, 9 (June 18, 1942) and 6 (July 2, 1942).
369. Specification and description of color. American War Standard of the American Standards Association (70 East 45th Street, New York 17, N. Y.), ASA-Z44-1942, approved June 17, 1942; Bull. Amer. Soc. Test. Mater. No. 119, 19 (1942). (HJK).
- 369a. Hunter, Richard S.
Photoelectric tristimulus colorimetry with three filters.
NBS Circ. 429 (July 1942); J. Opt. Soc. Amer. 32, 509 (1942); part of ASTM Symp. on Color, Am. Soc. Test. Materials, March 5, 1941.
370. Judd, Deane B.
Fresnel reflection of diffusely incident light.
J. Res. Nat. Bur. Stand. 29, 329 (1942) RP1504.
371. Judd, Deane B.
Facts of color-blindness.
J. Opt. Soc. Amer. 33, 294 (1943).
372. Judd, Deane B.
Colorblindness and the detection of camouflage.
Science 97, 544 (1943).
373. Newhall, S. M., Nickerson, D. and Judd, D. B.
Final report of the O.S.A. Subcommittee on the spacing of the Munsell colors. J. Opt. Soc. Amer. 33, 385 (July 1943).
374. Kelly, Kenneth L., Gibson, Kasson S. and Nickerson, Dorothy
Tristimulus specification of the Munsell Book of Color from spectrophotometric measurements.
J. Res. Nat. Bur. Stand. 31, 55 (1943) RP1549; J. Opt. Soc. Amer. 33, 355 (1943).
375. Sager, Elizabeth E., Schooley, Marjorie R. and Acree, S. F.
The assay of potassium p-phenolsulfonate, its pH range and its ultraviolet absorption spectrum.
J. Res. Nat. Bur. Stand. 31, 197 (1943) RP1558.
376. Chapters from the forthcoming report of the Optical Society of America Committee on Colorimetry, J. Opt. Soc. Amer. as follows:
Chapter 2. The concept of color, 33, 544 (1943).
Chapter 5. Physical concepts: Radiant energy and its measurement, 34, 183 (1944).
Chapter 6. The psychophysics of color, 34, 245 (1944).
Chapter 7. Quantitative data and methods for colorimetry, 34, 633 (1944).
Chapter 8. Colorimeters and color standards, 35, 1 (1945).
377. Kelly, Kenneth L.
Color designations for lights.
J. Res. Nat. Bur. Stand. 31, 271 (1943) RP1565; J. Opt. Soc. Amer. 33, 627 (1943).
378. Hunter, Richard S.
The geometric identification of reflection and transmission measurements.
J. Opt. Soc. Amer. 33, 685 (1943). (Abstract).
379. Sager, Elizabeth E., Keegan, Harry J. and Acree, S. F.
Basic ionization constant of metacresolsulfonphthalein; pH values and salt effects.
J. Res. Nat. Bur. Stand. 31, 323 (1943) RP1569.
380. Judd, Deane B.
Color vision.
Medical Physics, p. 265, Otto Glasser, Editor (Chicago Year Book Pub., Chicago, Ill. 1944). (See 429a).
381. Projector, T. H., Laufer, M. K. and Douglas, C. A.
An improved "zero-resistance" circuit

- for photo-cell photometry.
Rev. Sci. Instrum. 15, 107 (1944).
382. Judd, Deane B.
Small Color Differences, Discussion Session on, held in conjunction with the American Association of Textile Chemists and Colorists and the Federation of Paint and Varnish Production Clubs. March 1944.
Amer. Dyest. Rep. 33, 11 (May 1944), 33, 12 (June 1944), 33, 13 (June 1944), 33, 14 (July 1944).
383. Judd, Deane B.
Symposium on the Ostwald color system. Foreword.
J. Opt. Soc. Amer. 34, 353 (1944).
384. Hunter, Richard S.
Methods and standards for gloss measurement of camouflage materials. Metal Finish. (11 W. 42nd Street, New York 18, N. Y.) 42, 519 (1944).
385. Judd, Deane B.
Standard response functions for protanopic and deuteranopic vision. J. Res. Nat. Bur. Stand. 33, 407 (1944) RP1618; J. Opt. Soc. Amer. 35, 199 (1945). (See 416a).
386. Judd, Deane B.
The relation of protanopic to normal vision. J. Opt. Soc. Amer. 34, 768 (1944). (Abstract).
387. Keegan, Harry J.
On the measurement of the spectral apparent reflectance of low reflecting materials. J. Opt. Soc. Amer. 34, 770 (1944). (Abstract).
388. Keegan, Harry J. and Gibson, Kasson S.
On the use of working standards of didymium and vitrolite glasses for spectrophotometric measurements. J. Opt. Soc. Amer. 34, 770 (Dec. 1944). (Abstract).
389. Kelly, K. L.
A new system of color matching fluids. J. Amer. Pharm. Ass. 34, 59 (1945).
- 389a. Nickerson, Dorothy, Kelly, K. L. and Stultz, K. F.
Color of Soils. J. Opt. Soc. Amer. 35, 297 (1945)
390. MacLean, Marion E., Jenks, Priscilla J. and Acree, S. F.
Comparison of the purity of samples of organic solvents by ultraviolet spectrophotometry. J. Res. Nat. Bur. Stand. 34, 271 (1945) RP1643.
391. Teele, Ray P.
Photometer for luminescent materials. J. Res. Nat. Bur. Stand. 34, 325 (1945) RP1646; J. Opt. Soc. Amer. 35, 373 (1945).
392. Judd, Deane B.
Color standards for ruby mica. J. Res. Nat. Bur. Stand. 35, 245 (1945) RP1671.
393. Gibson, Kasson S.
Spectrophotometers. Proc. Amer. Soc. Test. Mater. 44, 725 (1945).
394. Keegan, Harry J.
Method for the spectrophotometry of reflection-reducing films on prisms. J. Opt. Soc. Amer. 35, 807 (1945). (Abstract).
395. Judd, D. B.
Application of the spectrophotometer to colorimetry. Engineering Experiment Station News (Ohio State University) 17, 32 (Dec. 1945).
396. Gibson, Kasson S., Haupt, Geraldine Walker and Keegan, Harry J.
Specification of railroad signal colors and glasses. J. Res. Nat. Bur. Stand. 36, 1 (1946) RP1688; J. Opt. Soc. Amer. 35, 772 (1945).
- 396a. Judd, Deane B.
Units in the trichromatic system. J. Opt. Soc. Amer. 36, 120 (L) (1946).
397. Reimann, Genevieve, Judd, Deane B. and Keegan, Harry J.
Spectrophotometric and colorimetric determination of the colors of the TCCA standard color cards. J. Res. Nat. Bur. Stand. 36, 209 (1946) RP1700; J. Opt. Soc. Amer. 36, 128 (1946). Condensations of this paper appear in Amer. Dyest. Rep. 35, 323 (1946) and in Text. Color. Converter 68, No. 6 (1946).
398. Hunter, Richard S.
A glossmeter for smoothness comparisons of machine-finished surfaces. J. Res. Nat. Bur. Stand. 36, 385 (1946) RP1708; J. Opt. Soc. Amer. 36, 178 (1946).

399. Reimann, Genevieve and Carmine, Earl J.
A device to facilitate the reading of spectrophotometric curves.
J. Opt. Soc. Amer. 36, 235 (1946).
400. Gibson, Kasson S., Haupt, Geraldine W. and Keegan, Harry J.
Comparison of railroad, traffic, and marine signal color specifications.
J. Opt. Soc. Amer. 36, 366 (1946). (Abstract).
401. Keegan, Harry J.
Specification of the colors of the A.S.A. safety color code.
J. Opt. Soc. Amer. 36, 367 (1946). (Abstract).
402. Reimann, Genevieve, Judd, Deane B. and Keegan, Harry J.
Color gets fingerprinted.
Text. Color. Converter 68, 18 (1946).
403. Stair, Ralph and Faick, Conrad A.
Infrared absorption spectra of some experimental glasses containing rare earth and other oxides.
J. Res. Nat. Bur. Stand. 38, 95 (1947) RP1761.
- 403a. Announcement of changes in electrical and photometric units.
NBS Circ. 459 (May 1947).
404. Gibson, Kasson S. and Balcom, Margaret M.
Transmission measurements with the Beckman quartz spectrophotometer.
J. Res. Nat. Bur. Stand. 38, 601 (1947) RP1798; J. Opt. Soc. Amer. 37, 593 (1947).
405. Haupt, Geraldine Walker and Douglas, Florence Lesch
Chromaticities of Lovibond glasses.
J. Res. Nat. Bur. Stand. 39, 11 (1947) RP1808; J. Opt. Soc. Amer. 37, 698 (1947).
406. Colors for molded area plastics.
Commer. Stand. Nat. Bur. Stand. No. 147, 1947; CS147-47. (Sets of these colors are available from Manufacturing Chemists' Association, Woodward Building, 15th and H Streets, N. W., Washington, D.C. for \$2.50 per set). (HJK & KLK).
407. ASTM proposed method for determination of color index of petroleum products by photoelectric colorimeter, report of Committee D-2 on petroleum products and lubricants, Appendix IV, Proceedings.
Amer. Soc. Test. Mater. 47, 307 (1947); Amer. Soc. Test. Mater. Standards on petroleum products and lubricants, October 1947, p. 615.
408. Keegan, Harry J.
Standards of reflectance.
J. Opt. Soc. Amer. 38, 658 (1948). (Abstract); Anal. Chem. 20, 387 (1948). (Abstract).
409. Launer, Herbert F.
Light-sensitive papers as controls for testing textile colorfastness and stability of materials under arc lamp exposure.
J. Res. Nat. Bur. Stand. 41, 169 (1948) RP1916.
410. Judd, Deane B.
Color perceptions of deuteranopic and protanopic observers.
J. Res. Nat. Bur. Stand. 41, 247 (1948) RP1922. Condensation of this paper appeared in J. Opt. Soc. Amer. 39, 252 (1949).
- 410a. Stair, Ralph
Spectral-transmissive properties and use of eye-protective glasses.
NBS Circ. 471 (Oct. 1948). Supersedes C421.
411. Judd, Deane B.
The Bezold-Brucke phenomenon and the Hering theory of vision.
J. Opt. Soc. Amer. 38, 1095 (1948). (Abstract).
412. Florence, Jack M., Glaze, Francis W., Hahner, Clarence H. and Stair, Ralph.
Transmittance of near infrared energy by binary glasses.
J. Res. Nat. Bur. Stand. 41, 623 (1948) RP1945.
413. Teele, Ray P. and Gibson, Kasson S.
A standard luminosity filter.
J. Opt. Soc. Amer. 38, 1096 (1948). (Abstract).
414. Judd, Deane B.
Response functions for types of vision according to the Muller theory.
J. Res. Nat. Bur. Stand. 42, 1 (1949) RP1946.
415. Color perception of the partially color-blind.
Tech. News Bull. Nat. Bur. Stand. 33, 1 (Jan. 1949). (DBJ).

416. Stair, Ralph, Glaze, Francis W. and Hall, Joseph J.
The spectral-transmissive characteristics of some German glasses.
The Glass Ind. (June 1949).
- 416a. Judd, Deane B.
Standard response functions for protanopic and deuteranopic vision.
J. Opt. Soc. Amer. 39, 505 (L) (1949).
(See 385).
417. Granville, Walter C. and Judd, Deane B.
Metameric colors and the macular pigment.
J. Opt. Soc. Amer. 39, 632 (1949).
(Abstract).
418. ICI (CIE) standard observer for colorimetry.
Tech. News Bull. Nat. Bur. Stand. 33, 87 (1949). (DBJ).
419. Judd, Deane B.
Current views on colour blindness.
Documenta Ophthalmologica 3, 251 (1949).
420. Judd, Deane B.
A comparison of direct colorimetry of titanium pigments with their indirect colorimetry based on spectrophotometry and a standard observer.
J. Res. Nat. Bur. Stand. 43, 227 (1949), RP2024; J. Opt. Soc. Amer. 39, 945 (1949); errata 40, 52 (1950).
421. Colors for polystyrene plastics.
Commer. Stand. Nat. Bur. Stand. No. 156, 1949; CS 156-49. (Sets of these colors are available from the Manufacturing Chemists' Association, Woodward Building, 15th and H Streets, N. W., Washington, D.C. for \$3.00 per set). (HJK and KLK).
422. Judd, Deane B.
The 1949 scale of color temperature.
J. Res. Nat. Bur. Stand. 44, 1 (1950) RP2053.
- 422a. Judd, Deane B.
Colorimetry.
NBS Circ. 478 (March 1950). Also with some changes as Measurement and Specification of Color, Chapter 9 in Mellon, Analytical Absorption Spectroscopy (John Wiley & Sons, New York, New York 1950). Also Boletim de Normalizacao Lisboa 3, 183 (1954).
423. Judd, Deane B.
El sistema ICI para la specification del color (The CIE system of color specification).
Anales de la Real Sociedad Espanola de Fisica y Quimica (A) 46, 123 (1950).
424. Gibson, Kasson S. and Belknap, Marion A.
Permanence of glass standards of spectral transmittance.
J. Res. Nat. Bur. Stand. 44, 463 (1950) RP2093. Condensation of this paper appeared in J. Opt. Soc. Amer. 40, 435 (1950).
- 424a. Gibson, Kasson S.
Spectrophotometry (200 to 1000 millimicrons).
NBS. Circ. 484 (Sept. 1949). Also as Spectrophotometers: Ultraviolet and visible regions. Chapter 5 in Mellon, Analytical Absorption Spectroscopy (John Wiley and Sons, New York, N. Y., 1950).
425. Commission Internationale de l'Eclairage, Report of Amer. Secretariat Committee on Colorimetry and Artificial Daylight.
Proc. eleventh session, Paris, 1948, p. 238 (1950). (DBJ).
426. Judd, Deane B., Plaza, Lorenzo and Belknap, Marion A.
A suggested relocation and respacing of the Union colorimeter scale for lubricating oil and petrolatum.
J. Res. Nat. Bur. Stand. 44, 559 (1950) RP2103. Condensation of this paper appeared in Bull. Amer. Soc. Test. Mater. No. 167, 63 (TP145) (June 1950).
427. Hammond, Harry K. III and Nimeroff, Isadore
Measurement of sixty-degree specular gloss.
J. Res. Nat. Bur. Stand. 44, 585 (1950) RP2105. Condensation of this paper appeared in Bull. Amer. Soc. Test. Mater. No. 169, 54 (Oct. 1950).
428. Projector, T. H.
Report on tests of flicker in color television.
Annex D to The Present Status of Color Television, Report of the Advisory Committee on Color Television to the Committee on Interstate and Foreign Commerce, United States Senate, July 14, 1950; Proc. I. R. E. 38, 998 (1950).

429. Judd, Deane B., Plaza, L. and Balcom, M. M.
Report on the fidelity of color reproduction by the CBS and RCA systems.
Annex E to the Present Status of Color Television, Report of the Advisory Committee on Color Television to the Committee on Interstate and Foreign Commerce, United States Senate, July 14, 1950; Proc. I. R. E. 38, 1000 (1950).
- 429a. Judd, Deane B.
Vision: Color.
Medical Physics (Year Book Publishers, Chicago, 1950), Vol. II, page 1149.
(See 380).
430. Judd, Deane B., Plaza, Lorenzo and Farnsworth, Dean.
Tritanopia with abnormally heavy ocular pigmentation.
J. Opt. Soc. Amer. 40, 833 (1950).
431. Judd, Deane B.
Ceguera para el color y teorías de la vision chromatica (Color blindness and color theories).
Anales de la Real Sociedad Espanola de Fisica y Quimica (A) 47, 35 (1951).
432. Keegan, Harry J. and O'Neill, H. T.
Spectrophotometric study of autumn leaves.
J. Opt. Soc. Amer. 41, 284 (1951).
(Abstract).
- 432a. Keegan, Harry J.
Federal Color Card for Paint.
J. Opt. Soc. Amer. 41, 649 (1951).
433. Barbrow, L. E.
International Commission on Illumination, adapted from report by L. E. Barbrow, Secretary of the U.S. National Comm., J. Opt. Soc. Amer. 41, 734 (1951).
434. Keegan, Harry J., Schleter, John C., Kelly, Kenneth L. and Sward, George G.
Standardization of safety colors.
J. Opt. Soc. Amer. 41, 874 (1951).
(Abstract). (See 316 and 436).
435. Judd, Deane B.
Basic correlates of the visual stimulus.
Chapter 22 in Stevens Handbook of Experimental Psychology (John Wiley & Sons, New York, N. Y., 1951).
436. Keegan, H. J., Kelly, K. L. and Schleter, J. C.
Standardization of national school bus chrome.
J. Opt. Soc. Amer. 42, 290 (1952).
(Abstract). (See 316 and 434).
437. Commission Internationale de l'Eclairage, Report of (American) Secretariat Committee on Colorimetry and Artificial Daylight.
Proceedings, twelfth session Stockholm, 1951, 1, 7, p. 1 (1952). (DBJ).
- 437a. Preservation of the Declaration of Independence and the Constitution of the United States.
NBS Circ. 505 (July 1951).
438. Hammond, Harry K. III and Nimeroff, I.
Minimizing anomalies in reflectance measurements with the Beckman quartz spectrophotometer.
J. Opt. Soc. Amer. 42, 367 (1952).
439. Haupt, Geraldine Walker
An alkaline solution of potassium chromate as a transmittancy standard in the ultraviolet.
J. Res. Nat. Bur. Stand. 48, 414 (1952)
RP2331. Condensation of this paper appeared in J. Opt. Soc. Amer. 42, 441 (1952).
440. Nimeroff, Isadore
Analysis of goniophotometric reflection curves.
J. Res. Nat. Bur. Stand. 48, 441 (1952)
RP2335. Condensation of this paper appeared in J. Opt. Soc. Amer. 42, 579 (1952).
441. Helson, Harry, Judd, Deane B. and Warren, Martha H.
Object-color changes from daylight to incandescent filament illumination.
Illum. Eng. 47, 221 (1952).
442. Judd, Deane B.
Color in Business, Science, and Industry.
(John Wiley & Sons, New York, N. Y., 1952) ix + 401.
443. IES Lighting Handbook, Second Edition.
(Illuminating Engineering Society, New York, 1952).
444. Davis, Raymond, Gibson, Kasson S. and Haupt, Geraldine Walker.
Spectral energy distribution of the International Commission on Illumination light sources A, B, and C.

- J. Res. Nat. Bur. Stand. 50, 31 (1953)
RP2384. Condensation of this paper
appeared in J. Opt. Soc. Amer. 43, 172
(1953). (See 225).
445. Keegan, H. J. and Schleter, J. C.
Use of reflection spectra for
photointerpretation purposes.
Photogrammetric Eng. 19, 107 (1953).
(Abstract).
- 445a. Protective display lighting of
historical documents.
NBS Circ. 538 (April 1953).
446. Jerome, Charles W. and Judd, D. B.
Specification of color-rendering
properties of fluorescent lamps.
Illum. Eng. 48, 259 (1953).
447. Nimeroff, I.
Propagation of errors in spectro-
photometric colorimetry.
J. Opt. Soc. Amer. 43, 531 (1953).
448. Judd, Deane B.
Entoptic color-perceptions of the
macular pigment by observers of normal
and color-defective vision according to
a three-components theory.
Publicado en "Coloquio Sobre Problemas
Opticos de la Vision", Tomo II,
Madrid, Spain, 1953.
449. Hammond, Harry K. III and Ingle,
George W.
Measurement of color, gloss and haze.
Symposium on Plastics Testing,
Amer. Soc. Test. Mater. Special
Technical Publication No. 132, p. 25
(1953).
450. Newman, S. B., Hammond, Harry K., III
and Riddel, H. F.
Becker value of Manila rope by
photoelectric reflectometry.
J. Res. Nat. Bur. Stand. 51, 141 (1953)
RP2443; Bull. Amer. Soc. Test. Mater.
No. 199, 84 (July 1954).
451. The Science of Color.
Committee on Colorimetry of the Optical
Society of America 1932-1952 (Thomas
Y. Crowell Co., New York, N. Y., 1953).
385 p. (KSG & DBJ).
452. Nimeroff, I. and Wilson, S. W.
A colorimeter for pyrotechnic smokes.
J. Res. Nat. Bur. Stand. 52, 195 (1954)
RP2488. Condensation of this paper
appeared in J. Opt. Soc. Amer. 44, 299
(1954).
453. Harrison, L. S.
An investigation of the damage hazard
in spectral energy.
Illum. Eng. 49, 253 (1954).
454. Keegan, Harry J., Belknap, Marion A.
and Cordrey, Dorothy J.
Spectral transmissive properties of
five selected optical glasses.
J. Res. Nat. Bur. Stand. 52, 305 (1954)
RP2505.
455. Judd, Deane B.
Instruments for measuring gloss,
hiding power, and color of paint films.
Amer. Paint J. 38, 66 (1954).
456. Judd, Deane B.
Problemas actuales del color.
Instituto de Optica "Daza de Valdes",
Madrid (1954).
457. Wyszecki, G.
Invariance of insidedness in projective
transformations of the Maxwell
triangle.
J. Opt. Soc. Amer. 44, 524 (1954).
458. Wyszecki, Günter
A regular rhombohedral lattice
sampling of Munsell renotation space.
J. Opt. Soc. Amer. 44, 725 (1954).
459. Wyszecki, Günter
A graphical interpretation of a three-
components theory of chromatic
adaptation in terms of the CIE
chromaticity diagram.
J. Opt. Soc. Amer. 44, 787 (1954).
460. Judd, Deane B.
Summary of Symposium on color of
transparent and translucent products.
Bull. Amer. Soc. Test. Mater.
Nos. 201 and 202 (Oct.-Dec. 1954).
461. Nickerson, D., Judd, D. B. and
Wyszecki, G.
Über eine tranformation des normva-
lenz-systems in ein empfindungsgemass
gleichabständiges system auf der
grundlage des Munsell-Systems.
Die Farbe 4, 285 (1955).
462. Keegan, Harry J.
Evaluation of small color differences,
Part II-spectrophotometric
determinations.
Bull. Amer. Ceram. Soc. 34, 23 (1955).
463. International Commission on Illumi-
nation, Report of (American)
Secretariat Committee on Colorimetry.
Proc., thirteenth session, Zurich

- (June 1955). (DBJ).
464. Judd, Deane B.
Progress report by OSA committee on uniform color scales.
J. Opt. Soc. Amer. 45, 673 (1955);
J. Illum. Eng. Soc. Japan 40, 8 (1956).
 465. Judd, Deane B.
Radical changes in photometry and colorimetry foreshadowed by CIE actions in Zurich.
J. Opt. Soc. Amer. 45, 897 (1955).
 - 465a. Kelly, K. L. and Judd, Deane B.
The ISCC-NBS method of designating colors and a dictionary of color names.
NBS Circ. 553 (Nov. 1955). Reprinted May 1, 1965.
 466. Keegan, Harry J.
Safety color codes.
Mag. Stand. 27, 21 (1956).
 467. Nimeroff, I., Hammond, H. K. III, Richmond, J. C. and Crandall, J. R.
Specular-gloss measurement of ceramic materials.
J. Amer. Ceram. Soc. 39, 103 (1956).
 468. Judd, Deane B. and Wyszecki, Günter.
Extension of the Munsell renotation system to very dark colors.
J. Opt. Soc. Amer. 46, 281 (1956).
 469. Helson, Harry, Judd, Deane B. and Wilson, Martha
Color rendition with fluorescent sources of illumination.
Illum. Eng. 51, 329 (1956).
 - 469a. Judd, Deane B.
Un nuevo punto de vista en la medida de la luz y el color (A new point of view in the measurement of light and color). Anales de la Real Sociedad Espanola de Fisica y Quimica, Serie A-FISICA.
Tomo LIII (A), pag. 43. Nos. 1-2-Enero-Febrero 1957.
 470. Nimeroff, I.
Two-parameter gloss methods.
J. Res. Nat. Bur. Stand. 58, 127 (1957) RP2774.
 - 470a. Keegan, Harry J.
New Federal Standard on Colors.
J. Opt. Soc. Amer. 47, 330 (1957).
 471. Hammond, Harry K. III
Gloss measurement-past, present and future.
Amer. Paint J. 41, 94 (1957).
 472. Judd, Deane B.
Medida del color en la industria.
Boletin Iberoamericano de Cultura Technica 1, 13 (1957).
 473. Nimeroff, Isadore
Propagation of errors in tristimulus colorimetry.
J. Opt. Soc. Amer. 47, 697 (1957).
 475. Judd, Deane B.
Description of color.
Proc. of the Perkin Centennial, 1856-1956, p. 177, Ogden Printing Co., 1957.
 476. Keegan, Harry J. and Schleter, John C.
Spectrophotometry and aerial reconnaissance.
J. Opt. Soc. Amer. 47, 1050 (1957). (Abstract).
 477. Kelly, Kenneth L.
Observer differences in color-mixture functions studied by means of a pair of metameric grays.
J. Res. Nat. Bur. Stand. 60, 97 (1958) RP2825.
 478. Judd, Deane B.
A new look at the ... Measurement of Light and Color.
Illum. Eng. 53, 61 (1958).
 - 478a. Keegan, Harry J.
Colorimetry from precise spectrophotometry.
J. Opt. Soc. Amer. 48, 281 (1958). (Abstract).
 - 478b. Nimeroff, I.
Review of Book The Measurement of Colour, 2nd Ed., by W. D. Wright, The Macmillan Co., New York, 1958.
Science 128, 585 (1958).
 479. Keegan, H. J., et. al.
Digital reduction of spectrophotometric data to Munsell renotations.
J. Opt. Soc. Amer. 48, 863 (1958). (Abstract).
 - 479a. Nimeroff, I. and Laufer, J. S.
Spectral band-pass determinations by a dynamic approach.
J. Opt. Soc. Amer. 48, 864 (1958). (Abstract).

480. Schleter, J. C., Judd, D. B. and Keegan, H. J.
Extension of the Munsell renotation system.
J. Opt. Soc. Amer. 48, 863 (1958).
(Abstract).
- 480a. Gibson, Kasson S.
Review of Book The Measurement of Colour, 2nd Ed., by W. D. Wright.
Rev. Sci. Instrum. 29, 802 (1958).
481. Kelly, Kenneth L.
Central notations for the revised ISCC-NBS color-name blocks.
J. Res. Nat. Bur. Stand. 61, 427 (1958) RP2911.
482. Judd, Deane B.
Some color demonstrations I have shown.
J. Opt. Soc. Amer. 49, 322 (1959).
483. Hammond, Harry K. III
Color measurement and specification.
Paint, Oil Chem. Rev. 122, 6 (1959).
- 483a. Nimeroff, I.
Status of ASTM methods and standards for appearance evaluation. ASTM Special Technical Publication No. 258, Symposium on Visual Aids for Standardizing and Communicating Product Appearance, p. 3, 1959.
- 483b. Barbrow, Louis E.
Memorandum on a procedure for obtaining spectral radiant intensities of tungsten filament lamps, 400-700 mμ.
J. Opt. Soc. Amer. 49, 1122 (1959).
- 483c. Keegan, H. J.
Color codes and the red-green confuser.
J. Opt. Soc. Amer. 49, 1136 (1959).
(Abstract).
484. Judd, Deane B.
Appraisal of Land's work on two-primary color projections.
J. Opt. Soc. Amer. 50, 254 (1960);
J. Photographic Science 8, 125 (1960).
485. Hammond, Harry K. III, Holford, Warren L. and Kuder, Milton L.
Ratio-recording spectroradiometer.
J. Res. Nat. Bur. Stand. 64C, 151 (1960).
486. Gibson, G. L., Hammond, H. K., Holford, W. L. and Nimeroff, Isadore.
Calibration of photometric devices.
J. Opt. Soc. Amer. 50, 508 (1960).
(Abstract).
- 486a. Keegan, H. J.
Spectrophotometry 190 to 2500 mμ.
J. Opt. Soc. Amer. 50, 508 (1960).
(Abstract).
487. Reinboldt, W. C. and Menard, J. P.
Mechanized conversion of colorimetric data to Munsell renotations.
J. Opt. Soc. Amer. 50, 802 (1960).
488. Judd, Deane B.
A five-attribute system of describing visual appearance.
ASTM Spec. Tech. Pub. No. 297, Amer. Soc. for Test. Mater., Philadelphia 3, Pa. (July 1961).
- 488a. Kelly, Kenneth L.
Review of Book Farver i Farver by Dr. Andreas Kornerup and J. H. Wanscher. ISCC Newsletter 155, 19 (1961).
489. Judd, D. B.
Maxwell and modern colorimetry.
J. Photographic Science 9, 341 (1961).
490. Nimeroff, I., Rosenblatt, J. R. and Dannemiller, M. C.
Variability of spectral tristimulus values.
J. Res. Nat. Bur. Stand. 65A, 475 (1961); J. Opt. Soc. Amer. 52, 685 (1962).
491. Hammond, Harry K. III
Accuracy of spectroradiometric measurements.
J. Opt. Soc. Amer. 51, 1470 (1961).
(Abstract).
492. Keegan, H. J., Schleter, J. C. and Weidner, V. R.
Ultraviolet wavelength standard for spectrophotometry.
J. Opt. Soc. Amer. 51, 1470 (1961).
(Abstract).
493. Kelly, K. L.
Some problems of color identification.
J. Amer. Inst. Architects 37, 80 (1962); Proc. of Conf. of Building Research Institute, National Academy of Sciences - National Research Council, Nov. 1961. Publication 1001, Building Research Institute, 1962.
- 493a. Keegan, H. J.
Reflectance-surface color codes.
J. Opt. Soc. Amer. 52, 604 (1962).
(Abstract).

494. Keegan, H. J., Schleter, J. C. and Judd, D. B.
Glass filters for checking performance of spectrophotometer-integrator systems of color measurement.
J. Res. Nat. Bur. Stand. 66A, 203 (1962).
495. Judd, D. B., Chamberlin, G. J. and Haupt, Geraldine W.
The ideal Lovibond color system.
J. Res. Nat. Bur. Stand. 66C, 121 (May-June 1962); J. Opt. Soc. Amer. 52, 813 (1962).
496. Judd, Deane B.
Blue-glass filters to approximate the blackbody at 6,500°K.
Die Farbe 10, 31 (1962).
497. Kelly, Kenneth L.
Coordinated color identifications for industry.
Nat. Bur. Stand. Tech. Note 152 (Nov. 1962).
- 497a. Howett, Gerald L.
Loci of discrepancy chromaticities for von Kries transformations.
J. Opt. Soc. Amer. 53, 510A (1963). (Abstract).
498. Keegan, H. J., Cleek, G. W., Schleter, J. C. and Weidner, V. R.
Absorption spectra of the lanthanide series of rare-earth glasses.
J. Opt. Soc. Amer. 53, 517 (1963). (Abstract).
499. Kelly, Kenneth L.
Lines of constant correlated color temperature based on MacAdam's (u,v) uniform chromaticity transformation of the CIE diagram.
J. Opt. Soc. Amer. 53, 999 (1963).
500. Emara, Sayeda H. and Teele, Ray P.
Development of filters for a thermoelectric colorimeter.
J. Res. Nat. Bur. Stand. 67C, 319 (1963).
501. Hammond, Harry K., III.
Spectroradiometry by means of modified spectrophotometers.
Appl. Opt. 2, 1207 (1963). (Letter to Editor).
502. Keegan, H. J., Cleek, G. W., Schleter, J. C., Weidner, V. R. and Smith, Carol Ann.
Absorption spectra of the first transition series of phosphate glasses.
J. Opt. Soc. Amer. 53, 1353A (1963). (Abstract).
503. Keegan, H. J., Cleek, G. W., Schleter, J. C. and Wiedner, V. R.
Further progress toward development of a single filter for the wavelength calibration of spectrophotometers between 0.25 and 2.6μ.
J. Opt. Soc. Amer. 53, 1353A (1963). (Abstract).
504. Keegan, Harry J., Schleter, John C. and Belknap, Marion A.
Recalibration of the NBS glass standards of spectral transmittance.
J. Res. Nat. Bur. Stand. 67A, 577 (1963).
505. Kelly, Kenneth L.
Review of Book The Natural System of Colours by Moses Harris (1766).
J. Opt. Soc. Amer. 54, 133 (1964). (534).
506. Hammond, Harry K., III.
Gloss standards and glossmeter standardization.
Off. Dig. 36, 343 (1964).
507. Judd, D. B. and Nimeroff, I.
Specification and designation of color, Chapter 57 of Treatise on Analytical Chemistry, Interscience Publishers, John Wiley & Sons, Part 1, Vol. 5, 1964.
- 507a. Judd, D. B.
Studies of illuminating and viewing conditions in the colorimetry of reflecting materials.
Color Eng. 2, 14 (1964).
508. Nimeroff, I.
Field trial of the 1959 CIE supplementary standard observer proposal.
J. Opt. Soc. Amer. 54, 696 (1964).
509. Nimeroff, Isadore.
Colorimetry in parafoveal fields. I. Color-matching functions.
J. Opt. Soc. Amer. 54, 824 (1964).
510. Nimeroff, Isadore.
Colorimetry in parafoveal fields. II. Additivity failure.
J. Opt. Soc. Amer. 54, 833 (1964).
511. Nimeroff, I.
Review of Book The Measurement of Colour, 3rd Ed., by W. D. Wright, D. Van Nostrand, Co., Inc., New York, 1964.
Science 134, (1964).

512. Judd, Deane B., MacAdam, David L. and Wyszecki, Günter.
Spectral distribution of typical daylight as a function of correlated color temperature.
J. Opt. Soc. Amer. 54, 1031 (1964);
also Illum. Eng. Soc. Tech. Transactions LX, 272 (1965).
513. Judd, Deane B.
Relation between normal trichromatic vision and dichromatic vision representing a reduced form of normal vision.
Acta Chromatica 1, 89 (1964).
514. Nimeroff, Isadore.
Spectral tristimulus values for the CIE (u,v,w) uniform spacing system.
J. Opt. Soc. Amer. 54, 1365 (1964).
515. Balcom, Margaret M.
Influence of red and blue preadaptation on hue matching of purple Munsell samples.
J. Opt. Soc. Amer. 54, 1397 (1964). (Abstract).
516. Gates, David M., Keegan, Harry J., Schleter, John C. and Weidner, V. R.
Spectral properties of plants.
Appl. Opt. 4, 11 (1965).
517. Nimeroff, I. and Yurow, J. A.
Degree of metamerism.
J. Opt. Soc. Amer. 55, 185 (1965).
- 517a. The ISCC-NBS Centroid Color Charts. NBS Standard Sample #2106, Supplement to the Color Names Dictionary, NBS Circular 553, the ISCC-NBS Method of Designating Colors and a Dictionary of Color Names. See also NBS Tech. News Bulletin, p. 70 (May 1965). (Obtainable from the Office of Standard Reference Materials, National Bureau of Standards, Washington, D.C. 20234 for \$9.00 per set of Charts). (KLK & DBJ).
518. Kelly, Kenneth L.
A Universal Color Language.
Color Eng. 3, 16 (1965).
519. Keegan, H. J., Schleter, J. C. and Weidner, V. R.
Infrared reflectance measurements, 2.5-22.2u.
J. Opt. Soc. Amer. 55, 607A (1965). (Abstract).
520. Kelly, Kenneth L. and Keegan, Harry J.
Revision of the ASA Safety Color Code, Z53.1-1953.
J. Opt. Soc. Amer. 55, 608A (1965). (Abstract).
521. Keegan, H. J., Schleter, J. C. and Nimeroff, I.
Photometric-scale calibration of spectrophotometers.
J. Opt. Soc. Amer. 55, 1580A (1965). (Abstract).
522. Kelly, Kenneth L.
Twenty-two colors of maximum contrast.
Color Eng. 3, 26 (1965).
523. Nimeroff, Isadore.
Comparison of uncertainty ellipses calculated from two spectrophotometric colorimetry methods by an automatic-computer program.
J. Opt. Soc. Amer. 56, 230 (1966).
524. Judd, Deane B.
Color designation and specification. Encyclopedia of Industrial Chemical Analysis, pp. 315, 1966.
525. Takasaki, H.
Lightness change of grays induced by change in the reflectance of gray background.
J. Opt. Soc. Amer. 56, 504 (1966).
526. Keegan, Harry J. and Weidner, Victor R.
Infrared spectral reflectance of frost.
J. Opt. Soc. Amer. 56, 523 (1966).
527. Judd, Deane B.
Color, section in The Encyclopedia of Physics, edited by Robert M. Besancon, Reinhold Publishing Corp., New York, 1966.
528. Judd, Deane B.
Fundamental studies of color vision from 1860 to 1960.
Proceedings of the National Academy of Sciences 55, 1313 (1966).
529. Goebel, David G., Caldwell, B. Patrick and Hammond, Harry K., III.
Use of an auxiliary sphere with a spectrophotometer to obtain absolute reflectance.
J. Opt. Soc. Amer. 56, 783 (1966).
530. Judd, Deane B.
Color Appearance.
Internationale Farbtagung, Luzern 1965, Vol. 1, p. 27; Musterschmidt-verlag, Göttingen, 1966.

531. Judd, Deane B.
Progress report for O.S.A. committee on uniform color scales.
Internationale Farbtagung, Luzern 1965, Vol. 1, p. 399; Musterschmidt-Verlag, Göttingen, 1966.
532. Keegan, Harry J. and Weidner, Victor R.
Infrared spectral reflectance of black materials.
J. Opt. Soc. Amer. 56, 1453A (1966). (Abstract).
533. Judd, Deane B.
Reflectance spectrophotometry.
Snell-Hilton Encyclopedia of Industrial Chemical Analysis, Vol. 3, John Wiley & Sons, Inc., New York, p. 376, 1966.
534. Kelly, Kenneth L.
Review of Book An Exposition of English Insects, with Curious Observations and Remarks by Moses Harris (1776). (506).
J. Opt. Soc. Amer. 56, 1786 (1966).
535. Judd, Deane B.
Physiological optics at the National Bureau of Standards.
Appl. Opt. 6, 13 (1967).
536. Takasaki, Hiroshi
Chromatic changes induced by changes in chromaticity of background of constant lightness.
J. Opt. Soc. Amer. 57, 93 (1967).
537. Goebel, David G.
Generalized integrating-sphere theory.
Appl. Opt. 6, 125 (1967).
538. Hammond, Harry K., III.
Review of Manual on Recommended Practices in Spectrophotometry.
Appl. Opt. 6, 173 (1967).
539. Judd, Deane B.
Review of Book Hermann von Helmholtz by Leo Koenigsberger.
Appl. Opt. 6, 174 (1967); also Physics Teacher, April 1967.
540. Judd, Deane B.
Interval scales, ratio scales, and additive scales for the sizes of differences perceived between members of a geodesic series of colors.
J. Opt. Soc. Amer. 57, 380 (1967).
541. Nimeroff, Isadore.
The variability of color measurement.
Color Eng. 5, 24 (1967).
542. Judd, Deane B.
Terms, definitions, and symbols in reflectometry.
J. Opt. Soc. Amer. 57, 445 (1967).
543. Kelly, K. L.
"Sand" to "Maize" to "Jasmine" to "Spanish Yellow".
J. Opt. Soc. Amer. 57, 703 (1967).
544. Kelly, Kenneth L.
Review of Book Principles of Color Technology by Fred W. Billmeyer and Max Saltzman.
Anal. Chem. 39, 67A (1967).
545. Judd, Deane B.
A flattery index for artificial illuminants.
Illum. Eng. XLII, 593 (1967).
546. U.S.A. Standards Institute, American Standard Safety Color Code for Marking Physical Hazards, Z53.1-1967, Approved Oct. 9, 1967. (HJK & KLK).
547. Nimeroff, I.
Review of Book Color Science by Wyszecki and Stiles.
Appl. Opt. 7, 85 (1968).
- 547a. Nimeroff, I.
Colorimetry.
National Bureau of Standards Monograph 104, Jan. 1968.
548. Caldwell, B. Patrick
Kubelka-Munk coefficients from transmittance.
J. Opt. Soc. Amer. 58, 755 (1968).
549. Kelly, Kenneth L.
Review of Book Color Science by Wyszecki and Stiles.
Phys. Today 21, 83 (1968).
550. Crawford, B. H. and Nimeroff, I.
Radiation sources and their power supplies, Chapter 2 of Techniques of photostimulation in biology, edited by B. H. Crawford, G. W. Granger and R. A. Weale, North-Holland Pub. Co., Amsterdam, Interscience Div. of John Wiley & Son, Inc., New York, 1968.
551. Howett, Gerald L.
Variation of absorptance-curve shape with changes in pigment concentration.
J. Res. Nat. Bur. Stand. 72A, 309 (1968).

552. Munis, R. H. and Finkel, M. W.
Goniometric measurements of infrared transmitting materials.
Appl. Opt. 7, 2001 (1968).
553. Judd, Deane B.
Color science and the paint industry.
J. Paint. Technol. 40, 470 (1968).
554. Nimeroff, I.
Metamerism and color-rendering indexes.
J. Opt. Soc. Amer. 58, 1557A (1968).
(Abstract).
555. Nimeroff, Isadore.
A survey of papers on degree of metamerism.
Color Eng. 6, 44 (1968).
556. Judd, Deane B.
1964 CIE supplementary observer applied to the colorimetry of rutile and anatase forms of titanium dioxide.
J. Opt. Soc. Amer. 58, 1638 (1968).
- 556a. Judd, D. B.
Discussion of a paper by A. A. Eastman, Color contrast vs. luminance contrast. Illum. Eng. 63, 618 (1968). (1964 CIE uniform color space extended to fields of small angular extent).
557. Nimeroff, I. and Schleter, J. C.
Professor Harry J. Keegan: Colorimetrists' Spectrophotometrist. App. Opt. 8, 757 (1969).
558. Yonemura, G. T. and Kasuya, M.
Color discrimination under reduced angular subtense and luminance.
J. Opt. Soc. Amer. 59, 131 (1969).
- 558a. Yonemura, Gary T.
Report on literature review and recommendations on visual aspects of television viewing.
NBS Report 10466, Feb. 1969.
- 558b. Howett, Gerald L.
Perception of chromaticness differences among near-neutral colors.
J. Opt. Soc. Amer. 59, 503A (1969).
(Abstract).
559. Nimeroff, I.
Review of Book Human Color Perception by J. J. Sheppard, American Elsevier, New York, 1968.
Physics Today 22, 81 (1969).
560. Nimeroff, I.
Review of Book The Rays are not Coloured by W. D. Wright (American Elsevier, New York, 1967).
Physics Today 22, 85 (1969).
561. Judd, Deane B.
Ideal color space.
Palette, No. 29 (1968), No. 30 (1968), No. 31 (1969). Published by Sandoz, Ltd., Dyestuffs/Chemical Div., CH-4002, Basle, Switzerland; also Color Eng. 8, 37 (1970).
562. Goebel, David G., Poole, Edward W. and Hartsock, Ronald G.
Instrument for measuring phototube spectral response.
Appl. Opt. 8, 1749 (1969).
563. Takasaki, Hiroshi
von Kries coefficient law applied to subjective color change induced by background color.
J. Opt. Soc. Amer. 59, 1370 (1969).
564. Nimeroff, I.
Color-match classifications assessed in terms of variable parameters.
J. Opt. Soc. Amer. 59, 1533A (1969).
(Abstract).
- 564a. Judd, Deane B. and Yonemura, Gary T.
Target conspicuity and its dependence on color and angular subtense for gray and foliage green surrounds.
Unpublished NBS Report, Nov. 1969.
- 564b. Balcom, Margaret M.
Influence of red and blue pre-adaption on hue matching of purple samples.
J. Opt. Soc. Amer. 60, 118 (1970).
(See 515).
565. Judd, Deane B. and Yonemura, Gary T.
CIE 1960 UCS diagram and the Müller theory of color vision.
J. Res. Nat. Bur. Stand. 74A, 23 (1970).
566. Nimeroff, I.
Metamerism index and color-difference index of metameric pairs.
J. Opt. Soc. Amer. 60, 733A (1970).
(Abstract).
- 566a. Howett, Gerald L.
Achromatic-point prediction.
J. Opt. Soc. Amer. 60, 951 (1970).
567. Nimeroff, I.
The Deuteranopic convergence point.
J. Opt. Soc. Amer. 60, 966 (1970).
568. Judd, Deane B.
Introduction to Goethe's Theory of Colours (Eastlake), MIT Press 1970.
J. Opt. Soc. Amer. 60, 988 (1971).

569. Judd, D. B.
Review of Book Daylight and its Spectrum, by S. T. Henderson (American Elsevier Publishing Co., Inc., New York, 1970).
J. Opt. Soc. Amer. 60, 1296 (1970).
570. Yonemura, G. T.
Opponent-color-theory treatment of the CIE 1960 (u,v) diagram.
J. Opt. Soc. Amer. 60, 1407 (1970).
- 570a. Howett, Gerald L.
Chromaticness-difference scaling in the Munsell value 6/ plane.
J. Opt. Soc. Amer. 60, 1572A (1970). (Abstract).
571. Semmelroth, C. C.
The prediction of lightness and brightness on different backgrounds.
J. Opt. Soc. Amer. 60, 1685 (1970).
572. Judd, D. B. and Eastman, A.A.
Prediction of target visibility from the colors of target and surround.
Illum. Eng. 66, 256 (1971).
573. Semmelroth, C. C.
Adjustment of the Munsell-Value and W*-Scales to uniform lightness steps for various background reflectances.
Appl. Opt. 10, 14 (1971).
574. Nimeroff, I.
Psychology of color.
Amer. Paint J. 55, 65 (1971).
575. Nimeroff, I.
Color-match classification by variable parameters.
Color Eng. 9, 13 (1971). (See 564).
- 575a. Howett, Gerald L.
Scaling of perceived color differences near the limits of the matte-paint gamut.
J. Opt. Soc. Amer. 61, 688A (1971). (Abstract).
576. Judd, Deane B.
Choosing pleasant color combinations. Lighting Design and Application 1, 31 (1971).
577. Nimeroff, I.
Review of Book Goethes' Color Theory (R. Mathaei) (Van Nostrand, Reinbold, N. Y. 1970).
J. Opt. Soc. Amer. 62, 465 (1972).
- 577a. Kohayakawa, Yoshimi
Contrast-difference thresholds with sinusoidal gratings.
J. Opt. Soc. Amer. 62, 584 (1972).
578. Nimeroff, I.
Instrumental Color Evaluation of Retroreflective Highway Sign Materials. July, 1971, Rept. No. FHWA RD-1071-1. NTIS, PB 204,586-Springfield, Va. 22151. (1972).
579. Nimeroff, I.
Editor, Precision Measurement and Calibration. Colorimetry (includes 43 papers on this subject), NBS SP300, 9, 460 pages (June 1972).
580. Nimeroff, I.
Does the U*V*W* have a spectrum locus? In Color Metrics, AIC Holland, eds. J. J. Vos, L.E.C. Friele and P. L. Walraven, p. 193 (1972).
581. Howett, Gerald L.
Legibility, esthetics, and page size. Unpublished NBS Report, Sept. 1972.
582. Judd, D. B.
Color in Visual Signaling. Proceedings NAS-Nat. Res. Council Symposium on Color Vision, The Spring Meeting 1971. Obtainable from Printing and Publishing Office, Nat. Acad. Sci., 2101 Constitution Ave., N.W., Washington, D.C. 20418, January 1973 (1972 Newton Lecture British Colour Group).

10. SUBJECT INDEX

- AAR transmittance scale 140, 215, 216, 217, 219, 220, 318
- AAR signal glass standardization 214, 215, 227, 262, 306, 307, 308, 318, 396
- Abaca fiber (see also becker value) 223, 224
- Abbot-Priest sunlight 114, 182, 223
- Absorptance
 - curve shape, changes 551
- Absorption spectroscopy 538
- Acetate plastic tape, infrared reflectance 532
- Achromatic point 269, 329, 566a
- Achromatopsia 419
- Adams theory 435
- Adams-Cobb formula 239
- Adaptation
 - chromatic 239, 269, 329, 435, 448, 459, 469, 497a, 515, 530
 - photopic 201, 207
- Additive scales 540
- Additivity
 - chromatic 564b
 - failure 510
- Aerial reconnaissance 476
- Age difference 477, 564b
- Albumin, infrared transmittance 251
- Aluminum, radiant reflectance 15
- Anatase-see Titanium dioxide
- Animal oils, spectral transmittance 65
- Animal tissue
 - spectral transmittance 153
 - infrared transmittance 153
 - ultraviolet transmittance 153
- AOCs members, tests of color sense 141, 142
- Appearance
 - aperture mode 488
 - color 488, 530
 - evaluation 483a, 579
- Army solutions 349
- Arons chromoscope (see also rotatory dispersion colorimetry) 16, 19, 42, 43, 46, 49, 54, 60, 141
- for calibrating Lovibond glasses 59
- ASTM
 - color index for petroleum products 407
 - standards 483a
- Atmosphere, spectral transmittance 50
- Background
 - influence 525, 536, 563, 573
- Bailey colorimeter 141
- Bandpass, spectral width 498
- Barium sulfate
 - spectral reflectance 529
- Bathroom accessories, colors for 285
- Bausch and Lomb spectrophotometer 98, 206, 336, 393
- Becker value of Manila rope 223, 224, 450
- Beckman spectrophotometer 375, 390, 393, 404, 438
- Beer's Law 159, 551
- Benzol, spectral transmittance 65
- Benzold-Brucke phenomenon 380, 411, 435
- Bittinger camouflage paints 54, 55
- Black
 - definition 350
 - infrared reflectance, see Infrared reflectance of blacks
- Blackbody (see also Planckian radiator, spectral composition)
 - luminous efficiency 7, 28
 - spectral composition 36, 38, 73, 98, 173, 234, 255, 496
- Blue arcs of retina 164
- Blue-wedge daylight photometer 148
- Book reviews
 - Peddie's "Color Vision" 80
 - Ladd-Franklin's "Colour and Colour Theories" 161
 - Hardy's "Handbook of Colorimetry" 283
 - Grant's "Psychological Optics" 299
 - The Measurement of Colour 478b, 480a, 511
 - Farver i Farver 488a
 - The Natural System of Color 505
 - An exposition of English Insects, with Curious Observations and Remarks 534
 - Manual on Recommended Practices in Spectrophotometry 538
 - Herman von Helmholtz 539
 - Principles of Color Technology 543
 - Color Science 546, 548
 - Human Color Perception 558
 - The Rays are not Coloured 560
- Brace spectrophotometer 50
- Brightness
 - determination 94
 - discrimination 125, 571
 - of paper 245, 364
- Building materials, radiant reflectance 15
- Business, color in 442
- Butter, spectral reflectance 24
- Cacti
 - infrared reflectance 519
- Camouflage
 - colors 54, 55, 372, 384
 - filters 44
 - paint 54, 55
- Candle, specification 292
- Carbon
 - arc, spectral composition 51, 70
 - carbon black, infrared reflectance 532
 - dioxide, infrared reflectance 526
 - yellow glass, spectral transmittance 228, 424
- Carotin (Carotene)
 - chemistry 516
 - infrared transmittance 222
 - spectral transmittance 77, 163, 191
 - ultraviolet transmittance 163, 191
- Cast stone, colors and finishes 246
- Cellophane, infrared transmittance 251
- Cenco-Sheard spectrophotometer 393
- Centroid, spectral, see Spectral centroid of light
- Centroid colors, see ISCC-NBS centroid colors

- Cerium, spectral transmittance of glasses containing 498
- Chemical constitution and color change 25
- Chemical substances, infrared transmittance 251
- Chlorophyll
 - chemistry 516
 - infrared transmittance 222, 516
- Chromatic
 - adaptation 239, 269, 329, 435, 448, 459, 469, 497a, 515, 530, 551, 564b, 566a
 - induction 536
- Chromaticity
 - diagram and spacing 373, 435, 457
 - difference colorimeter 260, 264, 320, 392, 397
 - scale, uniform, see Uniform chromaticity scales
 - sensibility 5, 6, 69, 111, 142, 179, 198, 199, 207, 208, 209, 210, 238, 242, 260, 268, 497a
- Chromaticness-difference perception 558b, 570a, 575a
- Chromium, spectral transmittance of glasses containing 502
- Chromosome, Arons, see Arons chromosome
- Chromotrope 10B, spectral transmittance 86
- CIE (ICI) standard observer, coordinate system and illuminants 205, 212, 221, 242, 268, 321, 326, 336, 344, 349, 369, 376, 413, 418, 419, 420, 423, 435, 436, 441, 444, 449, 465, 508, 514
 - 1964 UCS diagram 508, 570
 - space 514, 556a, 565, 572
 - 1960 (u,v) diagram 565, 570
 - 1964 U*V*W* system 573
 - Reports from Colorimetry Committee 202, 205, 425, 433, 437, 463
 - Supplementary observer 508, 556
- Cobalt blue glass, spectral transmittance 228, 424, 502
- Coefficient law, v. Kries 448, 459, 469, 528, 530
- Coleman spectrophotometer 353, 361, 362, 366, 393
- Collagen, spectral transmittance 362
- Color
 - aesthetics 574
 - analyzer, Keuffel and Esser (Model B) 361
 - appearance 530
 - application of in business 442
 - Atlas 488a
 - attributes 344, 488
 - blindness (see also Color vision theory) 141, 266, 371, 372, 385, 386, 410, 414, 415, 416a, 419, 430, 431, 435, 483c, 513, 520, 527, 528, 530, 546, 560, 565, 567, 582
 - cards, see TCCA, Horticultural, Federal Centroid 571a
 - change
 - by background color 563
 - charts, see Color systems
 - circle 505, 534
 - code, safety 401, 434, 466, 483c, 493a
 - communication 518
 - comparator 85
 - constancy 207, 269, 329, 435, 441
 - contrast 380, 435, 522, 530, 558a, 571
 - control of paint 553
 - conversion 269, 435
 - definition 344, 358, 488
 - demonstration 482
 - designations 518, 524, 534, 546
 - Dictionary of 282, 349, 376, 465a, 475
 - difference 564a
 - of metamers 566
 - NBS unit 321
 - difference perception 558b, 570a, 575a
 - differences, perceptibility 128, 178, 260, 264, 291, 314, 315, 320, 332, 343, 352, 356, 368, 382, 462, 558, 369a
 - discrimination 558, 561
 - fastness 368, 409
 - foliage 389a
 - grading 407, 426
 - grass 389a
 - harmony 488a, 568, 576
 - identification 493
 - insects 534
 - language 518
 - of leaves 432
 - matching 478b, 480a, 509, 511, 528, 530, 544, 547, 549, 564b, 575
 - classification 564
 - fluids 389
 - measurement 16, 341, 449, 455, 472, 474, 478, 483, 483a, 541, 560
 - mixture data 174, 180, 187, 192, 221, 376, 396a, 514
 - modes of appearance 329, 344, 358, 376, 488
 - names 534
 - names, Dictionary of C553, see ISCC-NBS system of color names
 - names, ISCC-NBS system of, see ISCC-NBS system of color names
 - names for drugs 270, 294, 317, 323, 328, 339, 359, 465a
 - names for interference colors 319, 367
 - psychology 574, 577
 - rendering, index 554
 - rendition of fluorescent lamps 446, 469
 - roll-up system 493, 497
 - scales
 - additive 540
 - internal 527
 - interval 540
 - natural, of pure color 6
 - ratio 540
 - uniform, see Uniform chromaticity (color) scales
 - soils 389a
 - space 540, 561

- spacing 579, 580
- specification 524
- standards 517a
- surface 329, 435
- systems 69, 282, 294, 340, 342, 349, 376, 383, 405, 495, 505, 517a, 534
- teaching 560
- television, color reproduction 429, 560
- television, test for flicker 428
- theory 456, 489, 527, 528, 568
- tolerances, specification 291, 314, 320, 321, 322, 478a, 561
- transformation 435
- of translucent products 460
- of transparent products 460
- trends 518
- volume 435
- of water 274
- work on. at NBS 29
- Color-order systems 518
- Color temperature
 - of artificial illuminants 64
 - change in lamps 265
 - correlated 194, 195, 499
 - by filter 134, 150, 182
 - measurement 179
 - meter 63
 - by rotatory dispersion 58, 70, 79, 91, 100, 109, 114
 - scale 64, 69, 74, 148, 158, 194, 203, 204, 210, 221, 226, 242, 268, 298, 376, 422
- Color vision
 - reduction forms 513
 - theory 164, 177, 180, 266, 349, 371, 372, 376, 380, 385, 386, 410, 411, 414, 415, 419, 429a, 430, 431, 441, 515, 559, 560, 563, 564b, 565, 566a, 568, 571, 574, 577, 579, 582
- Colorant formulation 553
- Colorimeters
 - general 69, 282, 344, 376
 - Bailey 141
 - disk mixture (K&E) 223
 - Duboscq 77, 96, 238, 247
 - Evelyn 351
 - for determining color temperature (see also Rotatory dispersion colorimeter) 179, 226
 - for determining psychological scales (see also Monochromatic colorimeter) 12, 208
 - glass wedge 148
 - Judd subtractive 320, 478a
 - Klett 247
 - monochromatic 20, 83
 - Pfund 66
 - photoelectric, see Photoelectric colorimeter
 - pyrotechnic smokes 452
 - quartz rotatory dispersion, see Rotatory dispersion colorimeter
 - Stammer 171, 247
 - subtractive 260, 264, 320, 392, 397, 478a
 - thermoelectric 500
 - visual 380
- Colorimetric coordinate systems 69, 196, 221, 238, 268
- Colorimetric purity, see Purity, colorimetric
- Colorimetry
 - additivity failure 510
 - angular conditions 507a
 - general 98, 221, 282, 345, 385, 395, 397, 402, 442, 443, 451, 456, 478, 488a, 489, 507, 511, 524, 527, 544, 547, 549, 558a, 560, 561, 578, 579, 580, 422a, 547a
 - parafoveal 509, 510
 - by polar coordinates 349
 - progress in (1927-1931) 202
 - statistical evaluation of errors 447, 473, 490
 - uncertainty 523, 579
 - variability 541, 579
 - work at NBS 29
- Colors for bathroom accessories, see Bathroom accessories, colors for
- Colors for kitchen accessories, see Kitchen accessories, colors for
- Commercial standards
 - for bathroom accessories 285
 - for cast stone 246
 - for kitchen accessories 284
 - for molded urea plastics 406
 - for polystyrene plastics 421
 - for sanitary ware 197
- Complementary colors 53, 69, 435
- Computer
 - applications 469, 480, 487, 523
 - program for colorimetric uncertainty 523
- Concrete, infrared reflectance 519
- Cone blindness 419
- Coniferous plants, heat transfer 516
- Conspicuity
 - of targets 556a, 564a, 572, 582
- Contrast
 - color 522, 530, 582
 - difference threshold 577a
 - ratio, see under Enamel, Paper, Paint, Tracing cloth, Opacity
 - sensibility 4, 48, 137, 152
- Copper
 - green glass, spectral transmittance 228, 424, 502
 - oxide 532
- Correlated color temperature 194, 195, 499
- Cottonseed oil, colorimetry (See also Vegetable oils) 13, 16, 19, 46
- Cover glass, in reflectance measurements 253
- Crispene 525, 536, 563, 571, 573
- Curve
 - reader 399
 - shape
 - absorptance 551
- Daltonism 419
- Davis-Gibson filters 123, 134, 150, 152, 160, 166, 173, 182, 192, 195, 221, 225, 444

- Daylight
 - artificial 32, 69, 79, 99, 114, 138, 148, 152, 182, 210, 313, 314
 - color temperature 64
 - natural 57, 69, 74, 79, 114, 148, 182, 210, 376, 569
 - photometer 148
 - spectral distribution 512
- Definitions, see Nomenclature
- Definition of color 344, 358
- Dental silicate cements, opacity 286
- Desert Island experiment 475
- Desert plants, heat transfer in 516
- Designation of color - see Color designation
- Detection
 - of invisible writing 41
 - of targets 556a, 572
- Deterioration (fading) by illuminants 453, 437a, 445a
- Deuteranopia 146, 385, 410, 415, 416a, 419, 431, 435, 567
- Dichromatism 146, 419, 431, 513
- Dictionary of Color, Maerz and Paul 282, 349, 376, 465a
- Dictionary of Color Names 475, 497, 465a
- Didymium glass 354, 388
- Diffusing media, spectral reflectance and spectral transmittance 235
- Discrepancy chromaticities 497a
- Disk mixture colorimeter (K&E) 223
- Documents, preservation 437a, 445a, 453, NBS Report 2254
- Dominant wavelength
 - determination 20, 82, 83, 94, 127, 212, 344, 349, 376, 435
 - least perceptible difference 149
 - purity relationship 133
- Dominator, modulator hypothesis 419, 435
- Drugs, color naming 270, 294, 317, 323, 328, 339, 359, 465a
- Duboscq colorimeter 77, 96, 238, 247
- Dyes
 - infrared transmittance 68
 - light fading 244
 - spectral reflectance 145, 172
 - spectral transmittance 68, 107
 - ultraviolet transmittance 68
- Dyes, food, spectral, infrared and ultraviolet transmittance 68
- Dysprosium, spectral transmittance 366, 498
- Eclipse of sun 101, 102
- Efficiency of worker, color of illuminant and 138
- Enamels, see Paints and pigments
 - contrast ratio 277
 - opacity 76, 277, 286, 293
- Equal-energy stimulus (filter) 110, 112, 225
- Equality of brightness photometry 125, 326
- Erbium, spectral transmittance 366, 498
- Esthetics 581
- Europium, spectral transmittance of glasses containing 498
- Evelyn colorimeter 351
- Excitation purity, see Purity, excitation
- Extinction coefficient 103
- Eye-protective glasses, see Glasses, eye-protective
- Fading index, Nickerson 320
- Fechner's law 4, 5, 155
- Federal Color Card 432a
- Federal Standard 470a
- Films, reflectance-reducing 394
- Filters
 - color-temperature-altering 496
 - infrared transmittance 108
 - luminosity 295, 312, 326, 413
 - photometric 168, 213
 - spectral 108, 240, 241, 247, 290, 296, 347, 444, 500
 - stray light 288
 - for testing spectrophotometers 228, 354, 388, 424, 494
 - for theatrical lighting 303
 - for thermoelectric colorimeter 500
 - ultraviolet transmittance 108
 - Wratten 116
- Flattery index for illuminants 545
- Flicker photometer 27, 83, 154, 168, 208, 235, 326
- Flicker photometry 125, 326
- Fluorescence
 - for detecting
 - invisible writing 41
 - adulteration 139
 - general 488a
 - measurement 391
 - in spectrophotometry 297, 393, 397
- Fluorescent lamps
 - color rendition 446, 469
 - spectral energy distribution 446
- Fluorescent screens, use of in signaling 40
- Foliage
 - color 389a
- Food dyes 68
- Fresnel reflectance 370
- Frost
 - infrared reflectance 526
- Gadolinium, spectral transmittance of glasses containing 498
- Gaertner Scientific Co. spectrophotometer 336, 393
- Gelatin
 - infrared transmittance 251
 - spectral transmittance 34
- General Electric recording spectrophotometer 301, 324, 336, 354, 361, 374, 379, 387, 388, 393, 394, 399, 478a
- Geodesic series of colors 540
- German glasses, spectral transmittance 416
- Gibson 560 mu filter, spectral transmittance 240, 241, 247

- Glarimeter 136
- Glass (see also Lovibond, Signal colors and glasses)
- binary, infrared transmittance 412
 - German, spectral transmittance 416
 - infrared, transmittance 153, 403, 412
 - luminous transmittance 22, 87, 216, 217, 219
 - optical, spectral transmittance 454
 - spectral transmittance 21, 34, 37, 47, 87, 153, 216, 217, 416, 504
 - ultraviolet transmittance 47, 153
- Glass wedge colorimeter 148
- Glasses, eye-protective
- spectral transmittance 39, 153, 298a, 410a
 - infrared transmittance 153, 298a, 410a
 - ultraviolet transmittance 39, 153, 298a, 410a
- Gloss, geometry 467, 470, 471, 506, 579
- measurement 136, 154, 161, 235, 254, 259, 263, 273, 275, 280, 289, 309, 341, 344, 363, 368, 384, 398, 427, 440, 449, 455, 467, 470, 471, 483a, 506, 579
 - of paint 309
 - of paper 245
 - standards 348, 384, 506
 - types of 259, 273, 275, 279, 341, 348, 363, 384, 398, 427, 435, 440, 467, 470, 471, 506
- Glossmeters 467
- Gold, spectral transmittance 34
- Goniometry
- infrared measurements 552
- Goniophotometry, see Gloss, measurement
- Graphite, infrared reflectance 532
- Grass
- color 389a
 - infrared reflectance 519
- Grassman's Laws 419, 435
- Gray sensation, stimulus 61, 71, 72, 92, 566a
- Ground glass
- scattering 552
- Gutta Percha, infrared transmittance 251
- Harris, Moses 505, 534
- Haze, measurement 449, 483a
- Heat transfer in
- coniferous plants 516
 - desert plants 516
 - lichens 516
- Helmholtz
- biography, review 539
 - theory of vision 419, 435
- Hering, theory 349, 411, 419, 435, 528
- Hess-Ives tint photometer 171
- Heterochromatic photometry, see Photometry, heterochromatic
- Hiding power, measurement 104, 455, 483a
- Highway marking yellow 434, 488a
- Highway signs 578
- Hilger sector photometer 25, 93, 103, 157, 159, 190, 336, 379
- Holmium, spectral transmittance 366, 492, 498, 503
- Horticultural Colour Chart
- H. T. yellow glass, spectral transmittance 424
- Hue, shift with change in purity 177, 570
- Hues of the spectrum colors 377
- Illuminant
- artificial, color temperature 64
 - color of, and efficiency of the worker 138
 - flattery index 545
 - mode of appearance 488
 - types 549
- Illumination
- chromatic 329
 - geometry 507a
 - meter, photoelectric 289
 - standards and nomenclature 310
- Incandescent lamps, luminous efficiency 8, 234
- Index
- color rendering 554
 - fading, Nickerson 320
- Induction, chromatic 536
- Industry, color in 442, 472
- Infrared
- reflectance
 - acetate plastic tape 532
 - blacks 532
 - cacti 519
 - carbon black 532
 - carbon dioxide 526
 - concrete 519
 - cupric oxide 532
 - transmittance
 - albumin 251
 - animal tissues 153
 - carotin 222
 - cellophane 251
 - chemical substances 251
 - chlorophyll 222
 - dyes 68
 - dyes, food 68
 - filters 108
 - gelatin 251
 - glasses 153, 403, 412
 - glasses, binary 412
 - glasses, eye-protective 153, 298a, 410a
 - Gutta Percha 251
 - Mother-of-pearl 153
 - polystyrene 251
 - rubber 251
 - vegetable oils 56, 65
 - xanthophyll 222
- Inorganic salt solutions, spectral transmittance 34
- Insects, color 534
- Insidedness, invariance 457
- Integrating sphere 129, 537
- Interference colors, color naming 319, 367
- Interval scales 540

Invisible writing, detection 41
 Iodine & potassium iodide, spectral transmittance 106
 Iron, spectral transmittance of glasses containing 502
 ISCC-NBS
 Centroid colors 481, 493, 517a, 518
 description 302
 system of color names 294, 311, 317, 323, 325, 328, 334, 337, 339, 349, 359, 369, 374, 376, 377, 389, 475, 481, 493, 497, 517a, 546, 465a
 ISO
 Safety colors 488a
 Judd subtractive colorimeter 320, 478a
 Keegan, Harry J.
 bibliography 557
 biography 557
 Keuffel & Esser
 disk mixture colorimeter 223
 spectrophotometer 86, 98, 105, 159, 361

 Kirchhoff's law 376
 Kitchen accessories, colors for 284
 Klett colorimeter 247
 König-Martens spectrophotometer (see also Visual spectrophotometer) 43, 60, 76, 77, 84, 86, 96, 122, 151, 156, 191, 200, 206, 213, 223, 324, 336
 v. Kries, coefficient law 448, 459, 469, 528, 530
 Kubelka-Munk formula 256, 533, 548

 Ladd-Franklin theory of vision 380, 435
 Lambert-Beer's law 121
 Lampblack, radiant reflectance 15
 Lamps 8, 234
 Land, see Two-color projection
 Lanthanum, spectral transmittance of glasses containing 498
 Lattice sampling of Munsell space 458, 468
 Leaves
 color 432
 infrared reflectance 516, 519
 infrared transmittance 516
 morphology 516
 radiant reflectance 15
 spectral reflectance 15, 445, 516
 Legibility of targets 581
 Lens, yellowing 477
 Leucoscope
 application to pyrometry 57, 58
 use 58, 135
 Lichens
 heat transfer 516
 infrared reflectance 519
 Light
 fading of dyes 244
 measurement 469a, 478
 mechanical equivalent 28
 scattering materials (see also paper, enamels, dental silicate cements, paints & pigments, tracing cloth) 248, 256, 277, 286, 293
 sources 550
 hue names 377
 luminous efficiency 8
 mercury arc 9
 monochromatic 3
 Lighting, theatrical, designation of filters 303
 Lightness induced by surround 525, 571
 Lightness steps 573
 Line elements 478b, 480a, 511, 544, 547, 549
 Liquid standards of gloss 348
 Liquids, spectrophotometer for 62
 Lovibond glasses
 calibration by Arons chromoscope 59
 measurement & specification 115, 122, 141, 143, 147, 156, 165, 229, 232, 237, 276, 304, 405, 495
 use 13, 46, 49, 77, 96, 142, 149, 166, 249, 250, 282, 287, 349, 376

 Lubricating oils, Union color scale 407, 426
 Luminance
 effect on chromaticity of perceived neutral point 566a
 factor 542
 Luminescence, measurement & specification 391
 Luminosity
 curve 5, 7
 factors 357, 376
 filter 295, 312, 359, 413
 function 33, 87, 120, 124, 184, 187, 371, 386, 430, 435
 of radiant energy 10, 27, 75, 87, 88, 90, 120, 125, 158, 184, 234, 326, 420
 Luminous efficiency
 of black body 7, 28
 of incandescent lamp 8
 Luminous reflectance
 of sheet materials 360
 Luminous transmittance
 glasses 22, 87, 216, 217, 219
 sheet materials 360
 Lummer-Brodhun contrast photometer 22, 25, 26, 215, 226, 234
 Lutetium, spectral transmittance of glasses containing 498
 Macular pigmentation 193, 417, 448, 477

 Maerz and Paul Dictionary of Color 282, 349, 376
 Magnesium carbonate, spectral reflectance 176
 Magnesium oxide, spectral reflectance 175, 176, 408, 529
 Manganese
 spectral transmittance of glasses containing 502
 Manila rope fiber, spectral reflectance 223, 224, 450
 Marine signals 400
 Martens photometer, use 18, 23a, 24, 39, 43, 51,

- 104, 136, 141, 142, 143, 145, 147, 148,
149, 153, 155, 165, 171, 175, 178, 179,
182, 183, 200, 214, 216, 223, 229, 230,
252, 376, 392, 397,
- Maxwell spot 448, 489
- Maxwell triangle 238, 239, 242, 296, 322a,
343, 345, 349, 352, 419, 435, 457, 460,
464, 489, 369a
- McCorquodale Process 432a
- Mechanical equivalent of light 28
- Mercury arc 9
- Metacresolsulfonphthalein, spectral
transmittance 379
- Metals, infrared reflectance 519
- Metamerism 54, 55, 417, 419, 435, 469a, 477,
478, 489, 517, 551, 553, 554, 555, 559,
564, 566, 575, 579
- Mr. Meter and Mr. Papermaker 338
- Mica, ruby 392
- Mineral, infrared reflectance 519
- Mineral oil, spectral transmittance 65
- Mixture data 174, 180, 187, 192, 221, 376
- Modes of appearance 329, 344, 358, 376
- Modulation transfer function 577a
- Molded urea plastics 406
- Monochromatic source 121
- Monochromatism 419
- Mother-of-pearl, spectral, infrared, ultra-
violet transmittance 153
- Müller theory of vision 380, 414, 419,
435, 528, 565, 570
- Multipurpose reflectometer 280, 300, 330,
331, 333, 335, 341, 347, 369a, 397,
- Munsell, color system 52, 69, 223, 282, 323,
340, 342, 349, 369, 373, 374, 376, 389,
397, 415, 435, 441, 461, 468, 480
- Munsell papers, spectral reflectance 52
- Munsell space
 - renotation 373, 479, 480, 487
 - lattice, sampling 458, 468
- Munsell value scale 52, 573
- Museum lighting, hazard 437a, 445a, 453
- NBS
 - physiological optics 535
 - transmittance standards for petroleum
products 407
 - unit of color difference 321
 - work on color 29
- National School Bus chrome 316, 434, 436,
488a
- Neodymium, spectral transmittance 353,
498, 503
- Neutral stimulus 61, 566a
- Nickel, spectral transmittance of glasses
containing 502
- Nickerson index of fading 320
- Nicols, use 14
- Night driving 560
- Nomenclature, terminology, definitions
 - color 30, 119, 369a
 - colorimetry 69, 83, 199, 221, 278, 329,
369a, 376
 - colorimetry of sugar 121
 - color names, see Color naming of drugs,
and ISCC-NBS system of color names
 - gloss 273
 - illumination 310
 - photometry 292, 365, 403a, 435
 - radiometry 258, 278, 435
 - reflectometry 93, 154
 - spectrophotometry 39, 47, 93, 159, 182,
247
- Nomograph, transmittance-thickness 39
- NPL white light source 185, 195
- Observer variability 559
- Ocular media, spectral transmittance 37,
435
- Ocular pigmentation 430
- Oleomargarine, spectral reflectance 24
- Olive oil, identification 139
- Optical glass, spectral transmittance 454
- Opacity
 - measurements 483a
 - of dental cements 286
 - of enamels 76, 277, 286, 293
 - of paints and pigments 286
 - of paper 18, 136, 230, 236, 245, 248,
286
 - standards 236
- OSA "excitation data" 69, 93, 174, 182, 185,
187, 189, 193, 199, 221, 223
- OSA Committee reports
 - colorimetry 69, 376
 - color terms 119
- Munsell spacing 373
- photographic intensity 116, 160, 173, 192
- photometry 98
- radiometry 98
- spectrophotometry 93
- uniform color scales 531
- Osculatory interpolation
 - fifth-difference 189
 - third-difference 184
- Ostwald color system 69, 349, 376, 383
- Page size 581
- Paint
 - contrast ratio 104, 455
 - fading rate 368
 - Federal Standard 470a
 - glass 309
 - infrared reflectance 519
- Paints and pigments
 - opacity 286
 - radiant reflectance 15
 - tinting strength 155, 170
- Paper
 - brightness 245, 364
 - color 66, 337
 - contrast ratio 18, 136, 230, 236, 245,
248, 286
 - gloss 245
 - light scattering 248
 - opacity 18, 136, 230, 236, 245, 248, 286

- whiteness 243, 257, 364
- Mr. Papermaker 338
- Perception
 - color difference 558b, 570a, 575a, 582
- Perceptual attributes 435
- Petroleum products, ASTM color index 407, 426
- Pfund colorimeter 66
- Phenolphthalein, spectral transmittance 25
- Phosphorescence 391, 488a
- Phosphorus, colorimetric determination 351
- Photoelectric colorimeters and photometers 271, 315, 332, 333, 352, 356, 380, 450, 452, 369a
- Photographic reflectometer, development 261
- Photographic sensitometry 116, 192
- Photography, unit of photographic intensity 116, 160, 173, 192
- Photointerpretation, use of spectrophotometry 445, 476
- Photometer
 - blue wedge 148
 - calibration 486
 - filter, monochromatic 450
 - flicker 27, 83, 154, 168, 208, 235, 326
 - Hilger sector 25, 103, 157, 159, 336, 379
 - Martens, see Martens photometer
- Photometric
 - filters 168, 213, 521
 - scale
 - errors 521
 - standards 521
 - units 521
- Photometry
 - blue wedge 148
 - calibration 148
 - equality of brightness 125, 326
 - by filters 252, 271, 341
 - flicker 125, 326
 - general 98, 376, 478, 478b, 480a, 511, 544, 547, 549
 - heterochromatic (see also Luminosity of radiant energy) 17, 22, 26, 79, 87, 91, 148, 168, 213, 326
 - by Leucoscope 58
 - by nicols 14
 - of paper and pulp 338
 - sensibility 4, 45, 48, 137, 152, 155
 - Talbot's law 1
 - zero resistance circuit 381
- Photopigment
 - spectral absorptance 530, 551
- Photosynthesis 516
- Phototube
 - spectral response 562
- Physiological optics 535
- Pigments, radiant reflectance 15
- Pigments, tinting strength 155, 170
- Planck's law 7, 73, 376, 422
- Planckian radiator
 - appearing gray 61, 71
 - spectral composition (see also Blackbody, spectral composition) 63, 69, 70, 95, 158, 182, 203, 226, 376
- Plant pigments
 - carotin 77, 163, 191, 222
 - chlorophyll 222
 - xanthophyll 96, 163, 191, 222, 516
- Platinum
 - black on gold, infrared reflectance 532
 - black on epoxy cement on copper 532
 - black, infrared reflectance 15
- Pleasantness
 - color combinations 568, 576
- Plocher color system 465a
- Polarization 376
- Polystyrene, infrared transmittance 251
- Polystyrene plastics, colors 421
- Porcelain enamel 252
- Potassium chromate, use as transmittancy standard 439
- Potassium p-phenolsulfonate, ultraviolet transmittance 375
- Praeseodymium, spectral transmittance 353, 498
- Priest-Gibson (N") scale for Lovibond glasses 165, 229, 232, 237, 250, 276, 287
- Priest-Lange reflectometer 252
- Projection, two-color, see Two-color projection
- Protanopia 146, 385, 386, 410, 415, 416a, 419, 431, 435
- Purity
 - colorimetric, determination 69, 83, 89, 94, 111, 117, 118, 196, 208, 209, 212, 221, 298, 344, 349, 376, 435
 - dominant wavelength relationship 133, 298
 - excitation, determination 82, 126, 435
 - least perceptible 111, 125, 126, 203, 298
 - saturation relationship 132, 196
- Purkinje effect 5, 435
- Pyrometry by means of Leucoscope 57, 58
- Pyrotechnic smoke, colorimeter 452
- Pyrotechnics, colorimetry 42
- Quartz rotatory dispersion colorimeter 16, 17, 32, 46, 57, 58, 61, 63, 64, 70, 74, 79, 91, 109, 135
- Radiance
 - factor 542
- Radiant energy
 - sources 549
 - spectral distribution 69, 70, 110, 182, 195, 225, 327, 376, 444, 483b
- Radiant intensity, spectral 483b
- Radiometry 376, 485, 491
- Railroad signal glasses 214, 215, 227, 262, 306, 307, 308, 318, 396
- Ratio scales 540
- Rayleigh-Jeans Law 376
- Razek-Mulden spectrophotometer 336
- Readability 581
- Reading comfort 138

- Reduction forms of normal color vision 513
- Reflectance
 - absolute measurement 529
 - effect of cover glass 253
 - factor 542, 546
 - Fresnel 370
 - general 98
 - geometry 378
 - luminous 154
 - of Manila rope 223, 224, 450
 - measurement 154, 161, 341, 483a
 - radiant
 - aluminum 15
 - building materials 15
 - lampblack 15
 - leaves 15
 - paint 15
 - and particle size 15
 - pigments 15
 - platinum black 15
 - silver 15
 - spectrophotometry 533
 - standards (see also MgO , MgCO_3) 388, 408, 529
- Reflectance-reducing films 394
- Reflectometer
 - multipurpose 280, 300, 330, 331, 333, 335, 341, 347, 369a, 397
 - photographic 261
 - Priest-Lange 252
 - Taylor 154
- Reflectometry
 - symbols 542
 - terms 542
- Repertoire de Couleurs 349
- Retina, blue arcs 164
- Retinal sensitivity, fluctuations 204
- Retroreflectors 488a, 578
- Rhodium, spectral reflectance 305
- Ridgway color system 69, 349, 376, 465a
- Road materials, infrared reflectance 15, 519
- Rocks
 - infrared reflectance 519
- Roofing materials, infrared reflectance 15, 519
- Rope, Manila, Becker value 223, 224, 450
- Rotating sector disk in photometry 1
- Rotatory dispersion colorimeter 16, 17, 32, 46, 57, 58, 61, 63, 64, 70, 74, 79, 91, 109, 135
- Rubber
 - infrared transmittance 251
 - optical properties 346
- Ruby, spectral transmittance 23
- Ruby mica 392
- Rutile-see Titanium dioxide
- Safety color code (ASA) 401, 434, 466, 493a, 520, 546
- Samarium, spectral transmittance 353, 498, 503
- Sanitary ware, colors for 197
- Saturation scale 132, 144, 209
- Saturation-purity relationship 132, 196
- Scales
 - additive 540
 - interval 540
 - ratio 540
 - see Color scales
- Scaling
 - color differences 558b, 570a, 575a
- Scattering materials 248, 256, 277, 286, 293, 552
- Schmidt & Haensch spectrophotometer 336
- Science, color 442
- Searchlights, spectral composition 43, 51
- Selenium orange glass, spectral transmittance 228, 424
- Sensibility to hue 75
- Shade number for eye-protective glasses 153, 298a, 410a
- Shadows, blue, on snow 113
- Sheet materials, luminous reflectance & transmittance 360
- Signal colors and glasses
 - marine 400
 - railroad 214, 306, 318, 396, 400
 - six-color system 272, 318
 - traffic 97, 328a, 400
- Signaling, by ultraviolet rays 40
- Silver, radiant reflectance 15
- Silvered mirror, spectral reflectance 50
- Skin
 - infrared reflectance 519
 - scattering 551
- Skylight, spectral distribution 327
- Skylight, natural 100
- Slit width errors 434, 486a
- Snow, blue shadows 113
- Soils
 - color 389a
 - infrared reflectance 519
- Solutions, spectral transmittance 182
- Specific absorptive index 121, 159, 171, 191
- Specification of color-see Color specification
- Spectral
 - absorptance
 - photopigment 530, 551
 - band pass, width 498
 - centroid of light 54, 60, 70, 79, 99, 194, 198, 207
 - composition of carbon arc 51, 70
 - distribution of NPL white light 185, 195
 - filters 108, 240, 241, 247, 290, 296, 347, 444
 - line width 3
 - radiant intensity 483b
 - reflectance
 - barium sulfate 529
 - butter 24
 - diffusing media 235
 - dyes 145, 172
 - lampblack 15
 - leaves 15, 445
 - magnesium carbonate 176

- magnesium oxide 175, 176, 408, 529
- Manila rope fiber 223, 224, 450
- Munsell papers 52
- oleomargarine 24
- paints 15
- pigments 15
- platinum black 15
- rhodium 305
- silvered mirror 50
- soot 15
- titanium pigments 418, 420
- response
 - phototube 562
- transmittance
 - animal oils 65
 - animal tissues 153
 - atmosphere 50
 - benzol 65
 - camouflage filters 44
 - carbon yellow glass 228, 424
 - carotin 77, 163, 191, 222
 - chromotrope 10B, 86
 - cobalt blue glass 228, 424, 502
 - collagen 362
 - copper green glass 228, 424, 502
 - didymium glass 354, 388
 - diffusing media 235
 - dyes 68, 107
 - dyes, food 68
 - dysprosium 366, 498
 - erbium 366, 498
 - gelatin 34
 - Gibson 560 mu filter 240, 241, 247
 - glasses 21, 34, 37, 47, 87, 153, 216, 217, 416, 504
 - of glasses containing
 - cerium 498
 - chromium 502
 - europium 498
 - gadolinium 498
 - iron 502
 - lanthanum 498
 - lutetium 498
 - manganese 502
 - nickel 502
 - terbium 498
 - titanium 502
 - tungsten 502
 - vanadium 502
 - zinc 502
 - glasses, eye-protective 39, 153, 298a, 410a
 - glasses, German 416
 - glasses, optical 454
 - gold 34
 - holmium 366, 492, 498, 503
 - H.T. yellow glass 424
 - inorganic salt solutions 34
 - iodine and potassium iodide 106
 - measurement 78
 - metacresolsulfonphthalein 379
 - mineral oils 65
 - Mother-of-pearl 153
 - neodymium 353, 498, 503
 - ocular media 37, 435
 - phenolphthalein 25
 - potassium chromate 439
 - praseodymium 353, 498
 - ruby 23
 - samarium 353, 498, 503
 - selenium orange glass 228, 424
 - solutions 182
 - thulium 366, 498
 - vegetable oils 45, 49, 56, 65, 249, 250, 287, 304
 - welding goggles 37
 - xanthophyll 96, 163, 191, 222, 516
 - ytterbium 366, 498, 503

Spectrophotometer 393

Spectrophotometers

 - abridged, see Photometry by filters
 - general 81, 93, 98, 190, 322, 336, 344, 369, 374, 404
 - for liquids 62
 - photoelectric 35, 78, 93, 98, 181, 190, 301, 336, 361, 376, 404
 - photographic 25, 93, 103, 157, 159, 190, 336, 379
 - thermoelectric 56, 65, 78, 93, 190
 - visual (see also König Martens spectrophotometer) 2, 11, 76, 77, 84, 93, 96, 151, 155, 190, 233, 235, 288, 336, 361, 376
 - with tristimulus integrators 494
 - Bausch and Lomb 98, 206, 336, 393
 - Beckman 375, 390, 393, 404, 438, 478a
 - Brace 50
 - Cary 478a
 - Cary-White 90, 519
 - Cenco-Sheard 393
 - Coleman 353, 361, 362, 366, 393
 - Gaertner Scientific Corp. 336, 393
 - G. E., see General Electric spectrophotometer
 - Hilger 25, 93, 103, 157, 159, 190, 336, 379
 - Keuffel & Esser 86, 98, 105, 159, 361
 - König-Martens, see König-Martens spectrophotometer
 - Razek-Mulden 336
 - Schmidt-Haensch 336
 - Spekker 379
 - Unicam 478a
 - Wright 478a

Spectrophotometry

 - errors in 297, 393, 397, 447, 486a
 - general 376, 395, 397, 402, 478b, 480a, 538, 544, 549, 579, 424a
 - photoelectric 35, 479
 - reflectance 533
 - standards 354, 388, 404, 408, 424, 439, 486a, 492, 498, 502, 503, 511, 533
 - use in photointerpretation 445, 476

Spectroradiometers 98, 251, 501

Spectroscopy, absorption 538

Spectrum colors, hues of the 377

Spekker spectrophotometer 379

- Sphere, integrating 537
- Stammer colorimeter 171, 247
- Standard
 - Abaca fiber 223, 224
 - color 517a, 579
 - directional reflectance 336
 - Federal - 595 470a
 - filters for testing spectrophotometers 228, 354, 388, 424, 494
 - gloss 348, 384, 506
 - heterochromatic photometry, glasses 22, 26, 87
 - illumination 310
 - IPC illuminant for photographic sensitometry 116, 160, 173, 192
 - marine 400
 - National School Bus chrome 316
 - opacity 236
 - photometric 234, 403a
 - Priest-Gibson (N") scale for Lovibond glasses 237
 - radiant intensity, spectral 483b
 - railway signal colors and glasses 214, 306, 318, 396, 400
 - reflectance 388, 408
 - ruby mica 392
 - spectrophotometric 404, 424, 439, 492
 - Textile Color Card 397, 402
 - traffic signal colors 97, 400
 - wavelength (didymium) 354, 388
- Standard observer (see also CIE standard observer) 261, 508
- Stefan-Boltzman law 36, 38, 376
- Stillings color blindness test 141
- Stone, cast, colors and finishes 246
- Stray light
 - errors 438, 486a
 - filters 288
- Subjective color phenomena 568
- Subtractive colorimeter 260, 264, 320, 392, 397, 478a
- Sunlight
 - Abbot-Priest 114, 182, 223
 - artificial 69, 79, 110, 112, 114, 126, 148, 150, 152, 182, 210, 223
 - natural 57, 69, 74, 79, 100, 114, 148, 182, 210, 376
- Surface
 - color 329, 435
 - mode of appearance 488
 - texture 560
- Surround
 - influence 525, 536, 563, 573, 576
- Talbot's law 1, 84, 151, 190
- Target
 - conspicuity 556a, 571
 - detection 556a, 571
 - visibility 556a, 571
- Taylor reflectometer 154
- Television
 - color contrast 558a
 - types 429
- Temperature, effect on transmittance 21, 23, 141, 150, 156, 182, 228
- Terbium, spectral transmittance of glasses containing 498
- Terminology, see Nomenclature
- Tetartanopia 419, 435
- Textile Color Card Association color cards 349, 397, 402
- Texture
 - surface 560
- Theatrical lighting, filters for 303
- Thermoelectric colorimeter 581
- Threshold, contrast difference 577a
- Thulium, spectral transmittance 366, 498
- Tinting strength of paint & pigments 155, 170
- Titanium
 - dioxide, anatase and rutile 556
 - pigments, spectral reflectance 418, 420
 - spectral transmittance of glasses containing 502
- Tracing cloth, contrast ratio 23a
- Traffic signals 97, 328a, 400
- Transformations of tristimulus specifications 349, 457
- Translucent products, color 460
- Transmittance
 - geometry 378
 - measurement 161
 - nomograph for thickness 39
- Transmittancy standard in ultraviolet 439, 492
- Transparent products, color 460
- Transparency of tracing cloth 23a
- Trichromatism 396a, 419
- Tristimulus colorimetry 341, 347, 349, 494, 369a
- Tristimulus integrators 494
- Tristimulus specification 174, 180, 193, 199, 205, 212, 219, 220, 227, 238, 239, 243, 251, 268, 290, 343, 344, 345, 349, 352, 358, 374, 376, 396a, 490
- Tritanopia, color discriminations 146, 419, 430, 431, 435
- Tungsten, spectral transmittance of glasses containing 502
- Two-color projection 484
- Ultraviolet
 - fading 409
 - photography, for detecting writing 41
 - solar energy distribution 255
 - spectrophotometry 157
 - transmittance
 - animal tissue 153
 - carotin 163, 191
 - dyes 68
 - dyes, food 68
 - filters 108
 - glasses 47, 153
 - glasses, eye-protective 39, 153, 298a, 410a

Mother-of-pearl 153
 organic solvents 390
 potassium p-phenolsulfonate 375
 xanthophyll 163, 191
 transmittancy standards 439, 444, 492
 Uniform chromaticity (color) scales 238,
 296, 320, 322a, 345, 435, 478b, 480a, 511,
 514, 531, 544, 547, 549, 556a, 558b, 570a,
 575a
 α - β diagram 343, 349, 352, 460, 466, 369a
 Union color scale for lubricating oils 426,
 478a
 U.S. Army color card 397
 Universal Color Language 517a
 Van Cittert double monochromator 162
 Vanadium, spectral transmittance of
 glasses containing 502
 Variability
 color measurement 541
 observers 559
 Vegetable oils (see also Cottonseed oil)
 spectral transmittance 45, 49, 56, 65,
 249, 250, 287, 304
 infrared transmittance 56, 65
 Vegetable pigments
 carotin 77, 163, 191, 222
 chlorophyll 222, 516
 xanthophyll 96, 163, 191, 222, 516
 Viewing angle 507a
 Visibility
 improvement 44
 radiant energy, see Luminosity of radiant
 energy
 targets 556a, 558a, 564a, 572, 581
 Vitrolite glass, use as reflectance standard
 388, 408
 Volume
 color 435
 mode of appearance 488

von Kries
 coefficient law 563
 transformations 497a
 Water
 color 274
 infrared reflectance 519
 Wavelength scale
 discrimination 125, 126, 127, 128, 208,
 565
 errors 486a
 standards
 didymium 354
 dysprosium 486a
 erbium 486a
 holmium 486a, 492, 498
 Weber's Law 577a
 Welding goggles, spectral transmittance 37
 White, definition 350
 White, sensation, stimulus 566a
 White light, standard 30
 White light, NPL 185
 Whiteness
 of paper 243, 257, 364
 specification 355
 Wien displacement law 36, 38, 158
 Wien-Paschen law 7, 376
 Wratten filters, use 116
 Wright's distribution data 185
 Xanthophyll (lutein)
 chemistry 516
 spectral transmittance 96, 163, 191
 infrared transmittance 222, 516
 ultraviolet transmittance 163, 191
 Y/B ratio 22, 26, 87
 Young-Helmholtz theory, discussion 80, 349,
 380, 419, 435, 441, 528
 Ytterbium, spectral transmittance 366, 498,
 503
 Zinc, spectral transmittance of glasses
 containing 502

11. AUTHOR INDEX

Acree, S. F. 361, 375, 379, 390
 Appel, W. D. 85, 86, 105, 145, 172, 223, 244
 Balcom, Margaret M. 404, 429, 515, 564b
 Barbrow, L. E. 234, 433, 483b
 Becker, Genevieve 223, 224, 397, 399, 402
 Beek, John, Jr. 362
 Belknap, Marion A. 424, 426, 454, 504
 Bittinger, Charles 119
 Breckenridge, F. C. 322a
 Brewster, J. F. 247
 Brickwedde, F. G. 111, 298
 Bright, H. A. 351
 Brode, W. R. 86, 103, 105, 106, 107, 159
 Brown, Mabel E. 228
 Bruce, H. D. 104, 155
 Burgess, George K. 102
 Caldwell, B. Patrick 529, 548
 Caldwell, F. R. 234

Carmine, Earl J. 399
 Chamberlin, G. J. 495
 Cleek, H. J. 502, 503
 Coblentz, W. W. 15, 27, 28, 34, 37, 65, 153,
 222, 251, 255, 305, C421
 Cordrey, Dorothy J. 454
 Cottrell, Casper L. 72
 Crandall, J. R. 467
 Crawford, B. H. 550
 Crittenden, E. C. 26, 168, 292, 310, 365
 Danielson, R. R. 76
 Dannemiller, Mary C. 490
 Davis, Raymond 123, 134, 150, 152, 166, 182,
 194, 195, 225, 444
 Douglas, C. A. 381
 Douglas, Florence L. 405
 Eastman, A. A. 571

- Eickhoff, A. J. 286, 368
 Emara, Sayeda H. 500
 Emerson, W. B. 27, 28, 34, 37
 Faick, Conrad A. 403
 Farnsworth, Dean 430
 Finkel, M. W. 552
 Florence, Jack M. 412
- Frehafer, M. Katherine 55, 68, 73, 76, 84, 95
 Gates, David M. 516
 Gathercoal, E. N. 317, 334
 Geil, Glenn W. 319, 367
 Gibson, Gilbert L. 486
 Gibson, Kasson S. 21, 23, 25, 35, 39, 40, 43, 44, 47, 51, 52, 56, 68, 78, 81, 82, 87, 88, 90, 91, 93, 94, 99, 100, 101, 108, 110, 115, 120, 122, 123, 124, 125, 134, 139, 147, 150, 152, 162, 165, 166, 181, 182, 183, 190, 192, 195, 213, 214, 215, 216, 217, 219, 220, 225, 227, 228, 232, 233, 237, 240, 241, 253, 262, 271, 274, 282, 283, 287, 288, 295, 297, 301, 306, 307, 308, 309, 312, 316, 318, 326, 327, 328a, 336, 342, 354, 374, 388, 396, 400, 404, 413, 424, 424a, 444, 451, 480a
 Gill, L. M. 249
 Glaze, Francis W. 412, 416
 Goebel, David G. 529, 537, 562
 Granville, Walter C. 417
- Hague, John L. 351
 Hahner, Clarence H. 412
 Hall, Joseph J. 416
 Hammond, Harry K., III 427, 438, 449, 450, 467, 471, 483, 485, 486, 491, 501, 506, 529, 538
 Harris, F. K. 100, 101, 115, 122
 Harrison, L. S. 453
 Harrison, W. N. 256, 277, 286, 293
 Hartsock, Ronald G. 562
 Haupt, Geraldine W., see Walker, Geraldine K.
 Helson, Harry 201, 269, 441, 469
- Hickson, E. F. 286, 316
 Hoffman, James I. 324
 Holford, W. L. 485, 486
 Howe, H. E. 25, 109
 Howett, Gerald L. 497a, 551, 566a, 558b, 570a, 575a, 581
 Hunter, Richard S. 245, 254, 259, 261, 263, 273, 275, 280, 289, 290, 296, 309, 315, 330, 331, 332, 333, 341, 343, 347, 348, 352, 356, 363, 368, 369a, 378, 384, 398
 Hyde, Edward P. 1
 Ingle, George W. 449
 Ives, Herbert E. 8, 9
 Jenks, Priscilla J. 390
- Jerome, Charles W. 446
 Jones, L. A. 116, 160, 173, 278
 Judd, Deane B. 118, 127, 132, 133, 143, 144, 146, 156, 164, 165, 169, 174, 177, 179, 180, 184, 185, 186, 187, 189, 193, 196, 198, 199, 201, 202, 203, 204, 207, 209, 212, 221, 226, 230, 236, 238, 239, 242, 243, 248, 253, 256, 257, 260, 264, 265, 266, 268, 269, 279, 286, 291, 293, 294, 299, 302, 303, 309, 311, 313, 314, 320, 321, 322, 323, 329, 337, 338, 340, 344, 345, 349, 350, 352, 355, 358, 364, 370, 371, 372, 373, 380, 382, 383, 385, 386, 392, 395, 396a, 397, 402, 410, 411, 414, 415, 416a, 417, 418, 419, 420, 422, 423, 425, 426, 429, 429a, 430, 431, 435, 437, 441, 442, 446, 448, 451, 455, 456, 460, 461, 463, 464, 465, 468, 469, 469a, 472, 475, 478, 480, 482, 484, 488, 489, 494, 495, 496, 507, 507a, 512, 513, 517a, 524, 527, 528, 530, 531, 533, 535, 539, 540, 542, 545, 553, 556, 556a, 561, 564a, 565, 568, 569, 572, 576, 422a, 465a
 Karrer, Enoch 48, 50
 Kasper, Charles 206
 Kasuya, M. 558
 Keegan, Harry J. 262, 274, 295, 297, 301, 306, 312, 354, 369, 379, 387, 388, 394, 396, 397, 400, 401, 402, 406, 408, 421, 432, 432a, 434, 436, 445, 454, 462, 466, 470a, 476, 478a, 479, 480, 483c, 486a, 492, 493a, 494, 498, 502, 503, 504, 516, 519, 520, 521, 526, 532, 546
 Kelly, Kenneth L. 270, 294, 323, 325, 328, 334, 335, 339, 359, 374, 377, 389, 389a, 406, 421, 434, 436, 477, 481, 488a, 493, 497, 499, 505, 517a, 518, 520, 522, 534, 544, 546, 549, 465a
 Kohayakawa, Yoshimi 577a
 Kuder, Milton L. 485
- Laufer, M. K. 381
 Launer, Herbert F. 360, 409
 Lewis, Lester C. 338
 Lloyd, Morton C. 97
 Lofton, R. E. 66, 136
 Long, M. B. 34
 Lundell, G. E. F. 324
 MacAdam, David L. 512
 Macbeth, Norman 148
 MacLean, Marion E. 390
- McAdam, Dunlap, Jr. 319, 367
 McNicholas, H. J. 39, 43, 44, 47, 51, 52, 68, 84, 129, 151, 154, 157, 161, 163, 191, 235, 250, 272
 Meggers, W. F. 43, 51
 Menard, J. P. 487
 Middlekauf, G. W. 22
 Moore, Dwight G. 348
 Munis, R. H. 552
 Munsell, A. E. O. 82, 94
 Newhall, Sidney M. 373
 Newman, S. B. 450
- Nickerson, Dorothy 342, 373, 374, 389a, 461
 Nimeroff, Isadore 427, 438, 440, 447, 452, 467, 470, 473, 478b, 479a, 483a, 486, 490, 507, 508, 509, 510, 511, 514, 517, 521,

- 523, 541, 547, 550, 554, 555, 557, 559,
560, 564, 566, 567, 574, 575, 577, 578,
579, 580, 547a
- Nutting, P. G. 2, 3, 4, 5, 6, 7, 10, 11, 12
O'Neill, H. J. 432
Paffenbarger, George C. 286
Peters, Chauncey G. 19, 24
Peters, H. H. 121, 171
Phelps, F. P. 121, 171
Plaza, Lorenzo 426, 429, 430
Poole, Edward W. 562
- Priest, Irwin G. 13, 14, 16, 17, 18, 19,
20, 24, 29, 30, 32, 33, 36, 38, 40, 41,
42, 43, 45, 46, 49, 51, 52, 53, 54, 55,
57, 58, 59, 60, 61, 62, 63, 64, 70, 71,
72, 74, 75, 79, 80, 82, 83, 84, 89, 92,
94, 100, 101, 111, 112, 113, 114, 117,
122, 125, 127, 128, 135, 137, 138, 142,
147, 148, 149, 165, 175, 176, 178, 205,
210, 252, 298, 23a
Projector, T. H. 381, 428
Reimann, Genevieve, See Becker, Genevieve
Reinboldt, W. C. 487
Richmond, J. C. 467
Richtmyer, F. K. 26
Riddell, Helen F. 450
Riley, J. O. 175
Rodden, Clement J. 353, 366
Roeser, William F. 226, 234
- Rosenblatt, Joan R. 490
Sager, Elizabeth E. 375, 379
Schaub, W. R. 322a
Schertz, F. M. 77, 96
Schleter, John C. 434, 436, 445, 476, 480,
492, 494, 502, 503, 504, 516, 519, 521,
557
Schooley, Marjorie R. 375
Schoonover, I. C. 300
Scofield, Francis 352
- Semmelroth, C. C. 571, 573
Shaw, Merle B. 286
- Skogland, J. F. 22, 158
Smith, Carol Ann 502
Snow, Chester L. 95
Stair, Ralph 153, 222, 251, 255, 305, 403,
412, 416, 298a, 410a
Stultz, K. F. 389a
Sward, George G. 434
Sweeney, W. T. 300
Sweo, B. J. 286, 293
Takasaki, Hiroshi 525, 536, 563
Taylor, A. H. 168
- Teele, Ray P. 295, 312, 357, 391, 413, 500
Thompson, G. W. 170
Troland, L. T. 69
Tyndall, E. P. T. 41, 43, 44, 47, 48, 50, 51,
68, 88, 90, 126, 208
Walker, Geraldine K. 143, 165, 214, 216, 217,
219, 227, 228, 229, 232, 237, 262, 276, 304,
306, 307, 308, 309, 318, 396, 400, 405, 439,
444, 495
Warren, Martha H. 441, 469
- Weidner, Victor R. 492, 502, 503, 516, 519,
526, 532
Welch, I. M. 105
Wensel, H. T. 226, 234
- Wilson, Martha, see Warren, Martha
Wilson, S. W. 452
Wingfield, Baker 361
Winters, S. R. 130
Wood, Lawrence A. 346
Wyszecki, Gunter 457, 458, 459, 461, 468
Yonemura, Gary T. 558, 558a, 564a, 565,
570
Yurow, J. A. 517

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBS-SP-393	2. Gov't Accession No.	3. Recipient's Accession No.			
4. TITLE AND SUBTITLE Colorimetry and Spectrophotometry: A Bibliography of NBS Publications January 1906 Through January 1973	5. Publication Date April 1974		6. Performing Organization Code			
	8. Performing Organ. Report No.					
7. AUTHOR(S) Kenneth L. Kelly	10. Project/Task/Work Unit No.		11. Contract/Grant No.			
	13. Type of Report & Period Covered Final					
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234	14. Sponsoring Agency Code					
	12. Sponsoring Organization Name and Complete Address (Street, City, State, ZIP) Same as Number 9.					
15. SUPPLEMENTARY NOTES Library of Congress Catalog Card Number: 74-5090						
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) <p>This bibliography of publications will serve as the key to the large amount of research into color measurement and specification, and color vision carried out by the staff of the National Bureau of Standards (NBS) in colorimetry and spectrophotometry. These 623 publications appeared in NBS publications and outside scientific and technical journals between January 1906 and January 1973. This material has been in constant demand by Bureau members as well as by outside individuals and organizations. The practical value of this wealth of information lies in its ready accessibility to the scientific and technical fraternity by title, by key words or by author, in the Library of Congress and in depository libraries such as large public and university libraries. A short organizational chronology of the colorimetry and spectrophotometry program is included.</p>						
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons) Bibliography; color; color codes; color measurement; colorimetry; spectrophotometry; vision.						
18. AVAILABILITY <input type="checkbox"/> Unlimited <input type="checkbox"/> For Official Distribution. Do Not Release to NTIS <input checked="" type="checkbox"/> Order From Sup. of Doc., U.S. Government Printing Office Washington, D.C. 20402, SD Cat. No. C13-10:393 - <input type="checkbox"/> Order From National Technical Information Service (NTIS) Springfield, Virginia 22151	19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED	21. NO. OF PAGES 54				
	20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED	22. Price 95¢				

NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH reports National Bureau of Standards research and development in physics, mathematics, and chemistry. Comprehensive scientific papers give complete details of the work, including laboratory data, experimental procedures, and theoretical and mathematical analyses. Illustrated with photographs, drawings, and charts. Includes listings of other NBS papers as issued.

Published in two sections, available separately:

• Physics and Chemistry (Section A)

Papers of interest primarily to scientists working in these fields. This section covers a broad range of physical and chemical research, with major emphasis on standards of physical measurement, fundamental constants, and properties of matter. Issued six times a year. Annual subscription: Domestic, \$17.00; Foreign, \$21.25.

• Mathematical Sciences (Section B)

Studies and compilations designed mainly for the mathematician and theoretical physicist. Topics in mathematical statistics, theory of experiment design, numerical analysis, theoretical physics and chemistry, logical design and programming of computers and computer systems. Short numerical tables. Issued quarterly. Annual subscription: Domestic, \$9.00; Foreign, \$11.25.

DIMENSIONS, NBS

The best single source of information concerning the Bureau's measurement, research, developmental, cooperative, and publication activities, this monthly publication is designed for the layman and also for the industry-oriented individual whose daily work involves intimate contact with science and technology—for engineers, chemists, physicists, research managers, product-development managers, and company executives. Annual subscription: Domestic, \$6.50; Foreign, \$8.25.

BIBLIOGRAPHIC SUBSCRIPTION SERVICES

The following current-awareness and literature-survey bibliographies are issued periodically by the Bureau:

Cryogenic Data Center Current Awareness Service (Publications and Reports of Interest in Cryogenics).

A literature survey issued weekly. Annual subscription: Domestic, \$20.00; foreign, \$25.00.

Liquefied Natural Gas. A literature survey issued quarterly. Annual subscription: \$20.00.

Superconducting Devices and Materials. A literature survey issued quarterly. Annual subscription: \$20.00.

Send subscription orders and remittances for the preceding bibliographic services to the U.S. Department of Commerce, National Technical Information Service, Springfield, Va. 22151.

Electromagnetic Metrology Current Awareness Service (Abstracts of Selected Articles on Measurement Techniques and Standards of Electromagnetic Quantities from D-C to Millimeter-Wave Frequencies). Issued monthly. Annual subscription: \$100.00 (Special rates for multi-subscriptions). Send subscription order and remittance to the Electromagnetic Metrology Information Center, Electromagnetics Division, National Bureau of Standards, Boulder, Colo. 80302.

Order NBS publications (except Bibliographic Subscription Services) from: Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

NONPERIODICALS

Applied Mathematics Series. Mathematical tables, manuals, and studies.

Building Science Series. Research results, test methods, and performance criteria of building materials, components, systems, and structures.

Handbooks. Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications. Proceedings of NBS conferences, bibliographies, annual reports, wall charts, pamphlets, etc.

Monographs. Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

National Standard Reference Data Series. NSRDS provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated.

Product Standards. Provide requirements for sizes, types, quality, and methods for testing various industrial products. These standards are developed cooperatively with interested Government and industry groups and provide the basis for common understanding of product characteristics for both buyers and sellers. Their use is voluntary.

Technical Notes. This series consists of communications and reports (covering both other-agency and NBS-sponsored work) of limited or transitory interest.

Federal Information Processing Standards Publications. This series is the official publication within the Federal Government for information on standards adopted and promulgated under the Public Law 89-306, and Bureau of the Budget Circular A-86 entitled, Standardization of Data Elements and Codes in Data Systems.

Consumer Information Series. Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today's technological marketplace.

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

OFFICIAL BUSINESS

Penalty for Private Use, \$300

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-215

